

**Impact of dairy co-operatives on the  
Economy of Rural households in  
Western Uttar Pardesh**

**THESIS**

Submitted To Kurukshetra University  
Kurukshetra

For The Award Of The Degree Of

**Doctor Of Philosophy**

In The Faculty Of

Dairying, Animal Husbandary And Agriculture

BY

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M.Sc.(Ag.) Agriculture Economics

*DIVISION OF DAIRY ECONOMICS, STATISTICS AND MANAGEMENT*

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*(I.C.A.R.)*

*KARNAL (HARYANA) INDIA*

**1986**

*Dedicated to my Parents*

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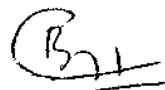
**1986**

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I certify that the work reported in this thesis entitled "Impact of Dairy Co-operatives on the Economy of Rural Households in Western Uttar Pradesh", was carried out by Mr. Lotan Singh, M.Sc. (Agr. Econ.) under my guidance for the requirement of the degree of DOCTOR OF PHILOSOPHY in the Faculty of Dairying, Animal Husbandry and Agriculture of the Kurukshetra University, Kurukshetra.



(C.B. Singh)

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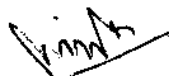
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CHAPTER I

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INTRODUCTION

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## INTRODUCTION

Dairying in India is recognised as a subsidiary occupation that provides gainful employment especially, to the underprivileged weaker sections of rural community. But despite the fact that our country is bestowed with a vast livestock wealth, its total milk production is estimated at about 38 million tonnes during 1984-85 which allows per capita per day availability of only 142 gm<sup>1/</sup> as against the minimum nutritional requirement of 280 gm.<sup>2/</sup> This indicates a wide gap between availability and requirement of milk in the country.

The supply of adequate quantity and quality of milk is a problem concerning both production and distribution. The consideration of various problems of milk producers, who are small and unorganised, suggests the necessity of some co-operative organization which could help increase milk production and provide remunerative price through organised milk marketing facilities in rural areas. It has been realised that dairy co-operatives could be a suitable instrument for the planned development of dairying in the country encompassing dispersed rural population of small milk producers with small scale production units. Evidence has shown that co-operation in the

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1/ Annual Reports: Ministry of Agriculture, Department of Agriculture and Cooperation, Govt. of India, Reproduced in Dairy India 1985 Year Book, p. 51.

2/ Patwardhan, V.N. (1960). Dietary Allowances for Indians, Calories and Protein, ICAR Special Report Series 35.

field of milk production, processing and distribution has made a significant progress in various European and Scandinavian countries and also in some states of India.

Milk co-operatives, in Gujerat established on Anand pattern, have recorded great success in solving many of the problems of the milk producers and also have been instrumental in enhancing milk production in the state. The co-operative movement, although officially sponsored, has spread in different states of the country and made rapid strides.

#### Present Status of Dairy Co-operatives in India:

The dairy co-operatives in India are almost as old as the "Co-operative Society Act" 1912 under which various types of non-credit societies could also be registered. Soon after passing this Act, the first dairy society "The Katre Co-operative Dairy Society", Allahabad was registered in 1913 in Uttar Pradesh. The other dairy co-operatives, inspite of the first World War, came-up soon. The number of primary milk co-operatives prior to first five year plan was 958 with a membership of 0.75 lakh in the country which increased to 3200 in 1960-61<sup>3/</sup>, 21106 in 1975-76 and 30,447 in June 1979<sup>4/</sup> with a membership of 27 lakhs. On June 1982<sup>5/</sup>, there were

<sup>3/</sup> Memoria, C.B. and Saksena, S.D. (1977). Cooperation in India 5th Edition, Kitab Mahal, 15 Thomwill Road, Allahabad.

<sup>4,5,6/</sup> India 1982, 1984, 1985, pp. 259, 312 and 309 respectively publication of Ministry of Indormation and Broadcasting, Govt.of India.

31,395 primary milk producer's Co-operatives with a membership of 29.5 lakh while on June 1983,<sup>6/</sup> there were 36,566 primary milk producers' Co-operatives with a membership of 32.21 lakhs. This increase could be effected through the planned efforts made in different Five Year Plans. It was reported that dairy co-operatives in India handled about 8 percent of the total milk trade during 1972 <sup>7/</sup>. By and large, milk co-operatives continued to be confined to Gujarat State despite the best efforts made by N.D.D.B. to help every state establish milk co-operatives on Anand pattern. This led N.D.D.B. to formulate a huge project known as Operation Flood which envisaged setting up of primary milk producers' Co-operative Societies. Thus, first Operation Flood (OF) launched in July 1970 with a budget of Rs. 100 Crores and extended till March, 1981 covered about 1.4 million milk producers in 27 of India's best rural milk-sheds who have joined 10000 dairy co-operatives. These dairy co-operatives are managed by the producers which enable them to market their milk efficiently avoiding the depreciations of traditional middlemen. The main object of OF-I was to flood the four major metropolitan cities of India with milk. The Operation Flood-II launched in October, 1978 with a massive budget of Rs. 485.5 crores,

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<sup>7/</sup> Bohan, N. (1972). Milk Co-operative in India, Indian Co-operative Review, Volume 9, No. 3, pp.407.

aims at covering 10 million rural families in 155 districts of 25 enlarged milk-sheds in the country and enabling groups of 5-7 unions in contiguous milk-sheds areas to form a "cluster" federation. These 25 "cluster" federations will be the organizational basis of Of-II. In all, the 25 milk-sheds areas, the Of-II would replicate the Anand pattern. The major activities taken up by the project include organization of three tier co-operative structure on Anand pattern at village, district and state levels, provision of technical inputs and establishing marketing and processing facilities in rural milk-sheds. It is expected that better organization of milk production and marketing would bring economic benefits to the milk producers and have positive impact on the household economy. Each union at the district level will consist of 200 to 600 village co-operative societies. It has been observed that despite the best efforts made by the state governments, the progress of dairy co-operatives has been confined to only five states in the country, i.e. Gujarat, Kerala, Maharashtra, Tamil-Nadu and Uttar Pradesh. The value of milk handled by primary milk producers' Societies in these states accounted for about 94 per cent of the total milk handled by the co-operative sector in all the states. The projected procurement of milk per day by dairy co-operatives in the country has been estimated at 18.3 million litres in 1984-85. It has been reported that there are at present

238 dairy plants in the country in the public and co-operative sectors, comprising 126 liquid milk plants, 37 milk product factories and 75 pilot milk schemes/rural dairies. Against their combined installed capacity of 140.91 lakh litres a day, the average throughput of milk was 92.48 lakhs litres during 1984 8/.

B. Status of Dairying and Co-operatives in Uttar Pradesh:

The Kaira Co-operative Dairy Society, Allahabad was the first society in the state as well as in the country registered 1913 in Uttar Pradesh. The state of Uttar Pradesh has a good milk production potential as it has a total of 25.7 million cattle and 13.9 million buffaloes accounting for about 29 and 22 per cent of the total cattle and buffalo population in the country respectively 9/.

It ranked first amongst all the states of the country in total milk production of about 58.53 lakh tonnes which allowed per capita per day availability of 147 gm of milk against 131 gm in the country in 1981-82. The milk production in the state has now increased to 67.50 lakh tonnes during 1984-85 10/. Surprisingly, the co-operative movement did not

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8/ India 1985 up cit p.2.

9/ Agriculture situation in India, Volume 34, No. 9, Dec.1980 pp.703-707.

10/ Dairy India 1985 Year Book p. 69.

make any significant progress in terms of growth of dairy co-operatives. The number of registered milk co-operatives increased from 3200 in 1975-76 to only 3206 in 1980-82. However, only 856 co-operatives actually functioned during 1981-82 11/. This is a very sad state of affair and need thorough investigation.

Specification of the problem:

Evidence has shown that the magnitude of success and efficiency of dairy co-operatives vary from one state to another for obvious reasons and depend upon various factors and constraints operating in a given situation. Various weaknesses and shortcomings in the organization and management of co-operatives in general have been highlighted in the past. But little efforts have so far been made in the country to examine empirically the impact of dairy co-operatives on various important economic parameters like resource use pattern, productivity of animals, production, consumption and marketed surplus of milk, employment and income levels of milk producer house-holds in different milk-shed areas of the country.

With this end in view, the present study was undertaken in two selected districts of Western Uttar Pradesh. The

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11/ Monthly Progress Report, August 1981, Pradeshik Cooperative Dairy Federation (P.C.D.F.) Ltd., Lucknow.

investigation has attempted to highlight some of the important problems of milk producers along with various constraining factors influencing the organization and functioning of dairy co-operatives. This, in turn, will help policy makers, planners and administrators in formulating suitable policies and making rational adjustment in the organization of dairy co-operatives. In view of the variation in the pattern of organization and functioning of co-operatives in selected two districts of Uttar Pradesh, the present study has analysed and compared their performance to examine the impact of dairy co-operatives on the important economic parameters.

The pattern of utilization of various resources in dairy enterprise and productivity of milk animals on different categories of households vary from one category to another as well as between non-members and members of the milk co-operatives. Therefore, the present study was directed to examine the effect of co-operative on the above aspect.

The success of dairy co-operatives and efficiency of a dairy plant in a particular area largely depends upon the levels of milk production, consumption and marketed surplus, therefore, an attempt has also been made here to study the impact of dairy co-operatives on these parameters and analyse various factors affecting marketed surplus of milk in different resource situations.

- 2) to analyse resource use pattern and productivity of milch animals of different categories of milk producers,
- 3) to assess the impact of dairy co-operatives on production, consumption and marketed surplus of milk and analyse the factors influencing the marketed surplus,
- 4) . to examine the impact of dairy co-operatives on employment and income pattern of milk producer house holds and
- 5) to estimate resource productivity in milk production and suggest readjustment in resource allocation for maximising income.

#### Organization of the Study:

The study has been divided into six chapters. Chapter I deals with the present situation of dairying and co-operatives along with the problems with specific objectives. A brief resume of the earlier work carried out in the concerned fields of the dairy co-operatives and productivity of resources in dairying has been discussed in Chapter II.

The agro-climatic and socio-economic features of the study area have been dealt with in Chapter III. The analytical frame work for the study is presented in Chapter IV. Results of the study are discussed thereon in Chapter V, followed by Summary and Conclusions in Chapter VI.

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CHAPTER II

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REVIEW OF LITERATURE

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## REVIEW OF LITERATURE

Considerable emphasis is being laid to rationalise the methods of milk production and marketing in the country. It is stated that planned development of dairying sector on co-operative lines could bring about desirable changes in rural India. In view of the urgent need for dairy development and organization of various programmes under Operational Flood II, assessment of existing dairy co-operatives and their impact on the household economy is very essential. Surprisingly, very little empirical work has been done in India to examine the impact of various dairy development programmes in general and dairy co-operatives in particular. However, relevant literature available is reviewed under the following two sections:

1. Impact of Dairy Development Programme/Co-operatives.
2. Resource Productivity in Dairy Enterprise.

### 1. IMPACT OF DAIRY DEVELOPMENT PROGRAMMES/CO-OPERATIVES

Desai and Narayan (1967) studied the impact of modernization of dairy industry on the economy of Kaira District of Gujarat State. The study revealed that the large section of milk producers who belong to poor communities now got assured

meal a day which was not available before the modernization of dairy industry. There was a positive improvement in the clothing of the children and housing conditions. The authors evaluated the impact in two forms (i) direct and (ii) indirect. The direct impact included the value added due to sale of milk and milk products through the organised sector and direct employment created by the modernization of dairy industry. The indirect impact included the creation of transport facilities, cattle feeds and organized cattle feed industry, improvement in cattle and crop production. It was observed that the modernization of dairy sector helped in providing a cheap and more nutritious cattle feed to the milk producers.

Patel (1972) reported the role of dairying in increasing employment potential for under-employed marginal farmers and landless labourers. He concluded that dairy enterprise offers considerable scope for diversification of the farm economy and increasing the income and employment potential of these poor sections of farming community who are exposed to seasonal under-employment. He estimated from recent investigation that dairy farming with crossbred cows provided higher net return and employment as compared to both mixed and arable farming.

Vyas and Chaudhary (1972) analysed the economics of dairy farming in Mehsena District and concluded that the overall percentage of marketed surplus to total production was observed to be higher in the dairy cluster relative to the non-dairy cluster which may be due to the existing marketing facilities of milk in the dairy cluster.

Ram et al. (1973) conducted a pilot study of 12 villages around Karnal (Haryana) and found that milk production and marketed surplus of milk tended to be higher in case of weaker sections. The marketed surplus of milk to total production was 67.6 per cent among landless producers and 31.2 per cent in the case of large farmers. The landless, marginal and small farmers together contributed 78 per cent to the total marketed surplus of milk whereas large farmers contributed only 4.9 per cent. They concluded that landless, marginal and small farmers had a greater role to play in increasing milk production in the area.

Ram and Singh (1974) studied the production and disposal of milk on the farms in milkshed area of Karnal district in Haryana state. They observed that the milk yield per milch animal for both cows and buffaloes was higher on small farm and landless households as compared to that of the medium and large farmers. The per capita consumption of milk increased with an increase in size of holding, whereas the marketed surplus of milk decreased with an increase in size of farms.

Ram et al. (1974) examined the relationship between marketed surplus of milk and independent variables like level of milk production, farm size, family size, investment in milch cattle and education level of the members of the milk producer households in 12 villages around Karnal. Multiple regression analysis was carried out using Cobb Douglas type of production function. The study revealed that the coefficient of the level of milk production, farm size and family size were found to be highly significant. The farm size had negative influence whereas the other two variables had positive effect on marketed surplus of milk.

Warule (1975) estimated the marketed surplus of milk and studied factors affecting it in the milkshed area of the Ambala Milk Plant (Haryana). He categorized the milk production into three categories, i.e. Commercial 'A' producers (those selling milk to the Co-operative Society, Ambala Milk Plant), Commercial 'B' Producers (those supplying milk to private vendors) and non-commercial 'C' Producers (those producing milk for self consumption only). Using multiple regression analysis, he concluded that marketed surplus of milk per household in the study area was positively associated with the level of milk production and price of milk and negatively associated with size of family and gross cropped area, although the regression coefficients for the size of family

were not statistically significant in 'A' and 'B' categories as well as for all commercial milk producers combined together. The marketed surplus was found to increase almost in the same proportion as the level of production. The price elasticity of marketed surplus for commercial 'B' producers was elastic and significant while for commercial 'A' producers, it was highly inelastic because of little variability in the producer's price of milk in this category. The commercial 'B' producers, who supplied milk to private vendors, were found to be price responsive. It was also observed that milk production had direct relationship with farm size.

Panday, Bhogal and Varma (1975) studied the economic impact of dairy development project in the milk shed area of Glaxo Laboratories, Aligarh. The authors evaluated the economic impact of the project activities on milk production, the number and composition of milch animals, the area under fodder crops, incidence of disease and the attitude and awareness of the farmers towards various dairy programmes. They observed that improvements have been made in animal breeding, disease control, nutrition and fodder development programmes of the project in the last five years. The buffalo population and milk production in the villages increased by 28 and 23 per cent respectively in 1974-75 over that of 1970-71. Further, the mortality rate, number of non-pregnant animals and incidence of disease declined to a very

low level. The total farm income increased by 15 to 18 per cent through dairying.

Shah (1975) studied the impact of Operation Flood Project on dairy development in India. The study revealed that the milk co-operatives made remarkable progress in terms of number of milk societies, total membership, share capital, reserve fund, net profits, milk collection and the value of milk and milk products handled. He also examined the impact of technical inputs provided by the milk co-operatives on the production and marketed surplus of milk, adoption of improved agricultural inputs and the annual income of the milk producers. It was observed that production and marketed surplus were higher in extension areas as compared to the control area. The marketed surplus of milk was higher in the case of weaker sections as compared to that of medium and large farmers.

Thakur (1975) conducted a study on the impact of dairy development through milk co-operatives in four districts of Gujarat state. The author observed the positive impact of milk co-operatives on the economic conditions of the weaker sections. The milk production per animal, marketed surplus of milk and total income on different size groups of milk producers were higher in the extension villages as compared to those of control villages. The milk production

per animal per day of cattle and buffalo in extension villages was 3.44 and 4.64 litres respectively as against 2.58 and 4.10 litres in control villages. It was further reported that the milk production per animal and the total marketed surplus of milk were higher in case of landless and small farmers as compared to the medium and large farmers of the extension area.

George (1977) studied the impact of dairy development on dairy techniques and technologies in terms of artificial insemination, balanced cattle feeds, fodders, and veterinary services. He reported that dairying created a substantial and varied job opportunities and improved rural farm economy. It was observed that dairy has moulded a certain socio-economic milieu for pioneering meaningful activities for economic transition. It may be assured with reasonable accuracy that for most of the farmers, dairying has become economically viable proposition.

Sherma et al. (1977) carried out a survey of 1807 milk producers in rural Kernal and reported that total quantity of milk available on the households for sale per day was estimated at 1933.5 kg. Among the milk producers selected in the sample, lower, medium group contributed the maximum to the marketed surplus (34.6 per cent) followed by landless (28.2 per cent), upper medium farmers (15.1 per cent), small farmers (10.6 per cent), large farmers (9.4 per cent) and marginal farmers (2.1 per cent).

Tyagi et al. (1977) conducted a survey to study the relationship of marketable surplus of milk with production and price in rural and urban situations in the Operational area of I.C.D.P. Karnal. Cobb-Douglas type of equation was fitted separately for rural and urban areas. The study revealed that production had a significant and positive impact on marketable surplus. The elasticity of marketable surplus with respect to production was 0.83 in the rural areas and 0.23 in urban areas. This indicated that the marketable surplus increased less than proportionate increase in total milk production. It was also observed that with one per cent change in the price of milk, it will be possible to increase the marketable surplus of milk by about 0.94 per cent in rural areas. Therefore, there appears a possibility of increasing marketable surplus in the same proportion if the price incentive is given to the milk producers. The regression coefficient of price of milk in urban areas turned out to be negatively significant at one per cent level, indicating thereby its negative impact on marketable surplus of milk.

Singh (1978) studied the structural differences in milk sales in two villages of Ludhiana district. It was observed that landless labourers and farmers operating upto 4 hectares were marketing more than half of their milk production while those operating more than 4 hectares were marketing less than one third. It was further revealed that farmers operating

upto 8 ha needed a critical level of 3 litres for home consumption whereas the minimum critical level for farmers operating above 4 ha was 4 litres. In case of farmers operating above 4 ha, there were fewer sellers as compared to other categories operating less than 4 ha. He stressed the need of placing a major emphasis on commercialising dairying among small farmers and landless labourers for higher standard of living and increased flow of milk to the market.

Varma and Pant (1978) studied the potentialities of increasing farm income and employment through dairying in Phulera tehsil of Jaipur district, where dairy development scheme was financed by the United Commercial Bank. The study revealed that green fodder is a limiting factor and farmers who want to introduce dairy enterprise on their farms should introduce fodder crops in their cropping pattern. It was observed that introduction of dairy enterprise on the crop farms will provide additional employment for family labour in lean periods in addition to a regular source of income.

Red (1981) conducted a study in Andhra Pradesh to evaluate economic and social benefits in ICDP area. The analysis showed that dairying was a good source to increase income and employment levels and thereby social and economic well-being of the marginal, small and medium farmers.

Dhaka (1981) studied the relationship between marketed surplus and various factors influencing it. The study revealed that the level of milk production had a positive impact on the marketed surplus. The influence of family size, educational level and monthly income of the household were observed to have inverse association with the levels of marketed surplus of milk.

Schadure, Singh and Patel (1981) conducted a study on milk production, consumption and marketed surplus in the villages around Karnal. They fitted Cobb-Douglas production function to study various factors affecting marketed surplus of milk on different categories of households. They observed that the regression coefficient of milk production variable was positive and highly significant in all the equations, however, the co-efficient of milk consumption was negatively significant indicating thereby their positive and negative impact respectively on marketed surplus of milk.

Patel et al. (1981) conducted a study of the Operational Research Project on the integrated milk and crop production for increased productivity, employment and income in the villages around Karnal. The rationale behind the project is that maximization of income from small farms is best ensured by a combination of dairy enterprise with crop cultivation. The project aims at increasing income and employment potential of the rural households through the transfer of new technology

of milk and crop production. The study revealed that on an average, the investment in dairy and crop enterprise increased by about 146 and 126 per cent in 1977-78 respectively over the base year of 1974-75. As regards the human labour employment, it was observed that there was an overall increase of 30 and 14 per cent in human labour utilization in crop and dairy enterprise respectively. It was observed that the overall net returns per hectare from crop enterprises increased by about 121 per cent over the base year with a maximum increase of about 226 per cent recorded on the small farms. The overall family labour income per animal registered an increase from Rs. 207 in 1974-75 to Rs. 549 in 1977-78. Thus, a precise picture was discernible in case of crop and dairy enterprise that the rural households in the project area were in a position to realise higher incomes over the base period.

Sharma et al. (1983) studied the impact of crossbred cows on the income of landless labour households in Karnal district. The study was an attempt to examine the investment pattern, milk yield per animal and production, consumption and marketed surplus of milk per household and estimate input and output ratio on the landless labour households maintaining crossbred cows and compare these with those of keeping buffaloes so as to assess the impact of the crossbred

cows. The keeping of crossbred cows was found to yield higher income to the landless labour households as compared to buffaloes, especially in the areas where adequate infrastructure for dairy development has been created. The beneficiaries having crossbred cows not only had a better financial position and higher employment opportunities for the family members as compared to that of non-beneficiary households having buffaloes. Higher milk yield and production in the case of beneficiaries lead to a higher proportion of the milk production being marketed resulting in higher income to the landless labour families as reflected by the higher expenditure to returns ratios. They concluded that milk production through crossbreds is an economic and viable proposition because it ensures a regular flow of income to the landless labour households in contrast to the uncertain and sporadic income from farm and non-farm labour.

Sharma and Singh (1984) concluded a study in the Intensive Cattle Development Project and observed an increasing trend of human labour employment per household on the cattle holdings while the reverse was true for labour use per standard animal unit on beneficiary households. The dairy enterprise on an average generated 250 and 205 man-days of employment on beneficiary and non-beneficiary households respectively. The family labour income of Rs. 1076 obtained

from a crossbred cow was much higher than that of a buffalo and local cow. Further, the beneficiary households recorded higher income from different types of milch animals as compared to that of non-beneficiary households. Therefore, they concluded that the project has been able to generate additional gainful employment in the study area and, thus, it can go a long way in boosting up income and employment levels especially on small cattle holdings.

Suhag et al. (1985) examined the existing cropping and livestock patterns of the selected farmers so as to suggest the optimum combination of the two enterprises in Kurukshetra district of Haryana state. The income was compared at existing and optimum levels of enterprise combination. In existing cropping pattern the net income of small, medium and large farmers was about ₹. 2085, ₹. 6023 and ₹. 15,458 respectively. The total net income from both the enterprises (crop and livestock) was about ₹. 4855, ₹. 9392 and ₹. 20,162 for small, medium and large farmers respectively. In case of optimum level of enterprise combinations, the net income from crops reduced on small and medium farms whereas it increased on the large farms. The decrease in case of small and medium farms was mainly due to reduction in area under paddy and wheat crops and increase in area under fodder crops. The total net returns from

crops and livestock in the optimum plans were about Rs. 8371, Rs. 14,279 and Rs. 25,234 on small, medium and large farms respectively showing an increase of about 72, 52 and 25 per cent over the net returns from the two enterprises in existing plan. As regards the human labour employment, it was observed that there was a gross increase of 46, 24 and 13 per cent in the utilization of human labour power in the optimum plan for small, medium and large farms respectively over the existing plan. Thus, the authors concluded that livestock enterprise has got a positive effect on income and employment generation on all the three sizes of farms.

Rao (1985) examined the income and employment potential of crop and dairy enterprises on different size groups of farms of Andhra Pradesh. The author observed that the returns from crop enterprises were nearly twelve times higher than the returns from dairy farming. In generating employment potential, the crop enterprise provided more employment as compared to dairy farming. It was also observed that hired labour utilization was more in crop enterprises whereas family labour use was bound to be more in dairy farming. The author concluded that dairy farming is more or less a house-hold subsidiary enterprise which can enhance the income and employment opportunities to the marginal and small farmers. The cheap credit and marketing facilities will enable them to

undertake dairying on commercial lines rather than as subsidiary occupation.

Sherma and Singh (1985) conducted a study to examine the investment pattern, proportion of wet and dry animals, average daily milk yield and cost of milk production on beneficiary households having crossbred cows and compare them with those of non-beneficiary households having buffaloes. It was observed that the crossbred cows and buffaloes maintained by beneficiary households indicated better performance than the local cows and buffaloes of non-beneficiary households in respect of milk yields, wet and dry ratio and cost of milk production in the study area.

Sherma and Singh (1986) studied the impact of I.C.D.P. karnal, on production, consumption and marketed surplus in rural karnal. The study revealed that production of milk was relatively higher on the beneficiary households than that of non-beneficiary households of cattle owners. With the rise in production, there was a corresponding increase in milk being marketed on the beneficiary households. The overall marketed surpluses of milk on beneficiary and non-beneficiary households was about 44 and 26 per cent respectively. The project can, therefore, be expected to provide a better ~~source~~ source of income through milk production.

Interestingly a positive impact of project was seen on consumption of milk. The per capita per day milk consumptions of 729 and 623 gm on beneficiary and non-beneficiary households respectively was much higher than the national average of 121 gm only.

## 2. RESOURCE PRODUCTIVITY IN DAIRY ENTERPRISES:

A number of empirical studies on input-output relationship and productivity of various resources in dairy enterprises have been reported. Various researchers have used different mathematical models and predicted different types of relationships. In this context, Jensen et al. (1942) used spillover function and found non-linear relationship in milk production. Heady (1981) studied the surface of milk production and found logarithmic, quadratic and square root functions equally good for finding milk production surface.

Yates et al. (1942) analysed the experimental data and found that increase in the level of feeding rates well in excess of conventional English standards were capable of giving substantial increase in milk yield. Response to additional starch equivalent obeyed the law of diminishing returns and was appreciably lower than that predicted by feeding standards at the recommended levels of feeding. Incorporating

the live weight changes and variations in milk yield, they showed that physiological efficiency fell off as feed intake was increased. They further demonstrated that feeding of bulky feeds might reduce milk yield owing to the limitations of total energy intake.

Ashb (1950) concluded that the input-output curves in milk production followed the law of diminishing returns. There existed an almost linear relationship between grain intake and milk output upto about 400 lbs of milk yield. From 4000 lbs to 6000 lbs only slight increase in milk output was observed and above 6000 lbs, increase in grain feeding did not result in increased milk yield.

Redman (1952) synthesized milk production function for 1200 lbs cows ~~capable~~ capable of giving 9000 lbs of 4 per cent fat corrected milk, when fed at the grain milk ratio of 1:1 and all the medium quality hay they would consume. He pointed out some of the serious limitations of feeding standard which assume (i) a constant rate of transformation and (ii) perfect substitutability between grain and roughage. He held that due to the fact that ruminant require some roughage to be healthy and active, it has never appeared practical to feed all grain even if concentrates are cheaper than hay. This indicates that product contours are curved and not straight

lines as implied in the conventional feeding standards. Thus the concept of diminishing returns and partial substitutability or complementarity of inputs appear to be applicable to the problem of dairy cattle feeding. He, however, conceded that the synthesized production functions will not be highly accurate from an empirical stand-point.

Antill (1955) attempted to examine the probable increase in gross output of milk likely to result from increase in the amounts of land, labour and capital inputs. The material for the study was drawn from the primary records of farm management surveys of England for the year 1951-52. He employed Ragnar Frisch's method of confluence analysis for detecting the spurious relationship in the multi-collinear sets of variables. Cobb-Douglas function that was developed, indicated increasing returns to soil, as judged by the criterion of minimum wage cost. The study was basically concerned with theory and statistical methodology.

Burt (1957) remarks that considerable variation occurred in the response at the same theoretical level of feeding. The analysis revealed that in nine out of eleven experiments including three or more input levels, the marginal returns to feed began to diminish at higher rates of input. Much of variations in the responses were attributed to

unknown nutritional factor affecting the responses to increased energy, to differences in the methods of assessing nutrient intakes and to differences in the responses of individual animals.

Orton (1958) attempted to establish diminishing rate of return to feed input using three sets of data viz., a cross section of milk cost investigation on farms in 1951-52, a time series data based on all farms in the milk cost investigation from 1939-51 for England and Wales and time series data based on Danish cost accounted records. The results gave conflicting answers. In the case of sample data from England and Wales, there was no visible sign of diminishing returns to feed while for Danish farms, a diminishing rate of return was discernible. In a subsequent article (1958), he reviewed experimental evidence which showed that marginal return to extra feed is likely to diminish. A function of linear-type considering the effect of change in level of starch equivalent on the marginal return per gallon of milk was calculated. The equation showed quite clearly the negative relationship between feeding and marginal response. He also observed that estimates of marginal return from time series evidence have been less desirable than those from inter farm series.

Pense et al. (1961) estimated regression relationship between milk yield and quality of concentrate fed per animal. The study related to cows and buffaloes, both in urban and rural areas, linear relations between the two characters were established in all the cases with highly significant coefficients for concentrates.

Kenn and House (1962) estimated the average cost functions from 195 dairy farms selected in the Louisville milkshed area of U.S.A. Resource quantity, resource combinations and level of technical efficiency were considered by fitting quadratic equation. The optimum herd size ranged from 40 cows for managers with technical efficiency index of 100 to 90 cows per manager with an index of 130.

The study by Hoover et al. (1967) reported economic optima for dairy cow ration. The approach was interdisciplinary involving production economists, dairy nutritionists and statisticians seeking to determine fundamental input-output relationship in milk production. From the production functions, milk isoquants, isoclines and marginal rate of feed substitution were derived. Combined with appropriate choice criteria, these permitted estimation of profit maximising conditions for cows of different characteristics under various environmental conditions. The primary variables selected were hay, grain and milk and auxiliary variables included were the index of ability, body weight changes, index of maturity and temperature index. The

initial criteria for choosing a production logic while the final selection was based on the value of  $R^2$  and the significance level of regression coefficients. This experiment was conducted primarily to derive economic optima for relevant prices of hay, grain, and milk for the use by dairymen. Although, there were some differences in the design and inclusion of variables, the results obtained gave considerable support to the validity of general conclusion of Heady and his co-workers.

Dhondyal and Singh (1965) in an investigation carried out in Azamgarh and Ghazipur districts of U.P. brought out the need for reorganising the farms in the direction of increased productivity of cows through greater investments on concentrate feeds and forages. The contribution of each item of expenditure on the gross income was estimated through regression analysis using linear model. They observed negative returns to feed in case of buffaloes and positive returns in case of cows.

Singh (1965) studied feed milk relationship using TDN and DCP as independent variables and fitted Cobb-Douglas type of production function. Based on the analysis, he suggested that in the rainy season, more TDN and in the summer and winter seasons more DCP should be fed to milking animals.

Considering the estimated price ratio of TDN to DCP, the farmers could obtain higher dairy income if they feed more DCP until the substitution ratio of the two nutrients equals the reverse of their price ratio thereby reaching the optimal combination of feed nutrients.

Bhattacharjee (1965) used data from the Farm Management Report of Punjab and fitted milk production function. He built up a linear model to relate milk yield to cost of roughage and concentrates. The analysis revealed that input of concentrate can be pushed much further than the current level to secure increases in output of milk.

Williams and Jones (1969) using step-wise regression technique with the introduction of dummy variables, fitted both linear and logarithmic functions to British herds. Five basic dependent variables were considered such as yield per cow, stocking density, output per forage acre, utilized starch equivalent per forage acre, and margin over feed cost per forage acre. The difference between two algebraic forms were surprisingly small. Concentrate feed per cow, breed, percentage of dry cow, fertilizer cost, land quality, seasonality, fodder input per cow, grazing acres per cow were the explanatory variables regressed with. The study brought out the overwhelming importance of stocking rate in the profitability of milk production and the inefficient use of concentrate

feeds on many farms. They argued the existence of economies of scale in the use of labour regardless of the system of herd operations.

Jacob et al. (1968), Aul et al. (1947) and Sankhayan and Joshi (1975) fitted linear and Cobb-Douglas production functions to study feed-milk relationships. Sankhayan and Joshi (1975) worked out resource productivity in milk production through crossbred and indigenous cows of Ludhiana district. Various factors influencing milk production included by them in the production function were the age of animal, stage of lactation, quantity of concentrate, dry and green fodders which explained about 82, 51 and 78 per cent of the total variation in the milk production in the case of indigenous cows, crossbred cows and pooled sample of both the breeds of cows respectively. The authors indicated that one per cent increase in the feeding of concentrates, dry fodder and green fodder increased the milk production at the geometric mean levels by 0.5<sup>3</sup>, 0.06 and 0.18 percent respectively in indigenous cows and 0.62, 1.05 and 1.28 per cent in crossbred cows.

Singh (1970) with the help of Cobb-Douglas function established input-output relationship in milk production for Murrah and non-descript buffaloes of Etah district in Uttar Pradesh. Apart from the physical quantum of individual

feed stuffs, he included labour, age and advancement of lactation as explanatory variables. In another approach, the nutrient content of feeds, namely, DCP and TDN minus DCP were regressed with milk yield. The study suggested significant scope for raising milk production by a readjustment of feed inputs in summer and rainy seasons. The importance of better care and management of animals was thrown in sharp focus by the very high marginal value product of labour input.

Sankhayan and Miglani (1973) estimated the production and supply functions for milk in Punjab. The Cobb-Douglas type of production function was fitted with fixed and variable costs as independent variables and the elasticities of milk production with respect to both the variables were found positively significant.

Dass and Sindhu (1973) in a study conducted in Punjab found that the feeds, labour and expenditure on cattle sheds and equipments were highly significant under Cobb-Douglas specification of the model. The marginal value productivities of the above mentioned variables were higher than their respective prices indicating thereby the ample scope of increasing investment in these inputs.

Aul et al. (1974) estimated the Cobb-Douglas and linear production functions for milk yield based on various

independent variables like lactation number, green fodder, concentrates, labour, medical expenses for crossbred cows and buffaloes of Punjab region. Green fodder in crossbred cows and labour in buffaloes were observed to be positive and statistically significant variables.

Agrawal et al. (1974) studied the importance of various inputs in milk production. They fitted linear model which explained 43 and 55 per cent of the total variation in milk production for cows and buffaloes respectively. The regression coefficients of expenditure on green fodder, concentrates and management were found to be positive and significant whereas those of stage of lactation were negatively significant

Numar et al. (1974) utilizing experimental data at U.D.N.I., Karnal, ascertained the response of milk to DCP and TDN in green fodder and concentrates for Harperker, Red Sindhi and Brown Swiss crossbred cows. In addition, the impact of environmental factors like temperature and relative humidity have also been studied. They fitted Cobb-Douglas production function for DCP in all the three breeds. The elasticity of TDN in green fodder was positive as against the negative elasticity coefficient for TDN in concentrates. They suggested rational choice of green fodders which could simultaneously meet DCP and TDN requirements and result in increased milk production at reduced cost. It was also observed that a rise

in relative humidity and temperature had adverse effect on milk production but crossbreds showed relatively better adaptability to high humid conditions.

Kumar et al. (1975) fitted the lactationwise milk production functions in Haryana cows. They observed that variables of feed, depreciation on cows and miscellaneous expenditure were found to be positive and statistically significant indicating thereby their positive impact on milk production.

Chhikara and Gangwar (1975) estimated the marginal value productivity of inputs used in milk production through crossbred cows and Murrah buffaloes in the hinterland area of Jind Milk Plant of Haryana. They observed that regression coefficients of green fodder and concentrates in local cows, dry fodder and concentrates in buffaloes and green fodder in case of crossbred cows were found to have significant impact on milk yield of the respective categories of animals.

Singh (1975) and Singh and Jha (1975) also made an attempt to study various factors influencing milk yield following production function approach. They concluded that significant scope existed for raising milk production through readjustment of feed inputs.

Patel et al. (1976) studied the economics of crossbred cattle through production function approach and inferred that stage of lactation and girth had a negative and positive impact on milk yield respectively and both the variables were found to be significant.

Charto Ram (1977) worked out the input-output relationship for dairy enterprise in TFD area of Patiala district of Punjab. The study indicated that the order of lactation had a positive and significant impact on milk production in case of buffaloes, whereas stage of lactation was negatively correlated with the milk output and was highly significant. The coefficient of veterinary expenses and value of animal were positive and statistically significant for beneficiary households while only veterinary expenses turned out to be positive and significant for non-beneficiary households.

Gangadharan (1978) fitted linear, Cobb-Douglas and quadratic production functions to study the feed milk relationship for the milch cattle in Kerala state. The milk production surface was found to be linear. The advancement of lactation and heart-girth had significant impact on the level of milk production in all the lactating cows except the non-descripts in high ranges. All of the linear specifications discussed above assumed constant rate of change over the input use and, thus, failed to conform to the economic logic.

Singh (1979) fitted linear, quadratic and Cobb-Douglas production functions in Haryana State to estimate the input output relationship in milk production. The regression coefficients for age variable was negatively significant for all the seasons, however, the regression coefficient of the concentrates, consistently had impressive influence on milk yield. The production function analysis also showed that the farmers were feeding more dry fodder in the rainy and winter seasons. The use of human labour was also found in excess in the winter and summer seasons.

Kumar and Singh (1980) studied the lagged effect of feed nutrients and milk yield on the current milk production in crossbred and Sahiwal cows maintained at I.A.R.I., New Delhi. The study revealed that the past milk producing ability of the cow was the major factor for predicting current milk production. The magnitude of the coefficient of lagged milk indicated a fairly slow rate of response adjustment of milk production to feed input. They suggested that the proper feeding and management over the lactation period is necessary for full exploitation of the milk production potential.

Kangrajan (1980) examined the relative magnitude of resource productivity in the crossbred and non-descript cows reared in Puriyer District (Tamil Nadu) by fitting

Cobb-Douglas production function. The study revealed that the quantity of concentrate fed to animal, value of animal and managerial ability showed a positive relationship with the milk yield in both the functions. TDN supplied by roughages and the amount of labour employed exhibited a negative relationship with milk yield. The economic optimum for application of concentrates worked out to 1533 kg of TDN per year in the case of crossbred cows as against 446.9 kg only for non-descript cows. However, the MVP for these variables were much higher for crossbreds.

Singh and Rao (1980) studied the various factors influencing milk production in different seasons and worked out the marginal productivities of important factors for different crossbred cows viz., Holstein x Local (HL), Brown Swiss x Local (BL) and Jersey x Local (JL) owned by the urban households of Karnal city. The study revealed that the coefficient of DCP variable was positive and statistically significant in all the seasons for all the breeds except JL cows in summer season. This indicated that there is considerable scope for increasing milk production by feeding more of DCP through green fodders. This view was also supported by the positive marginal value products of DCP in different seasons. The study further revealed the negative coefficients and marginal value products of

digestible non-protein nutrients (DNPN) in the rainy season for BL cows and in winter season for JL cows. This suggested that over feeding of DNPN through wheat straw in the respective seasons to these cows should be reduced. It was noted that labour had a seasonal significance as indicated by its positive marginal products in certain seasons. This indicated that incorporation of dairy enterprise by low income households in the study area can increase labour productivity and family income.

Kao and Singh (1986) conducted a study on economics of crossbred cows and estimated input-output relationships and productivity of resources in different seasons for different types of crossbred cows maintained by urban households of Kernal city. They used linear, log-linear and semi-log functions to achieve the objective and concluded that milk yields of different genetic groups of crossbred cows can be increased by making slight adjustments in the existing feeding patterns in different seasons.

Patel et al. (1982) studied the feed-milk relationships in crossbred cows, buffaloes and local cows in the villages around Kernal. They concluded that the crossbred cows were superior to local cows and buffaloes under field conditions on the basis of important production traits. The green

fodder had significant and positive impact on milk yields in almost all the seasons for three types of dairy animals except in rainy season for crossbred cows while the concentrate was found to have positive influence on milk yields in all the seasons for crossbred cows and in rainy and summer seasons for buffaloes. However, dry fodder variable turned out to be significantly negative in summer season for buffaloes and in rainy seasons for local cows. These facts lead one to infer that there is enough scope for increasing milk production of dairy animals in different seasons by making regional adjustment in their feeding schedule.

Gupta and Patel (1985) evaluated the profitability of investment of 30 crossbred cows unit maintained on a commercial and scientific lines by the N.D.R.I., Karnal. The authors worked out the pay back period, average return on investment, net present value (NPV) and internal rate of return to investment in crossbred cows. It was observed that the average return to investment (ARI) worked out to about 25 per cent which was quite high as compared to the opportunity cost of the funds estimated at ten per cent. At ten per cent rate of discount, the NPV turned out to be about Rs. 2.20 lakhs which was nearly double the initial capital investment of Rs. 1.10 lakhs, the cost-benefit ratio was estimated at 3.00. Thus, the study revealed that capital investment in herd of

crossbred cattle on a commercial scale was a highly lucrative proposition. It not only fetched a handsome rate of return even under a less favourable situation than the one taken up for the case study but also ensured a quick recovery of initial investment.

A close perusal of the foregoing review of relevant literature reveals that most of the studies pertained to the impact of dairy enterprise, crossbred cows and dairy development programmes on various economic parameters. However, a good number of researchers have attempted to examine input-output relationship and productivity of various resources that go into the milk production process. But these studies have not been done in a systematic and comprehensive manner. Besides, very few sporadic attempts have been made to examine the impact of dairy co-operatives which also do not give complete picture in totality. Therefore, the present study was undertaken which not only examines the impact of dairy co-operatives on various crucial parameters but also compares the performance and effect of milk co-operatives organised on Anand and U.P. patterns. Besides, efforts have also been made in the study to assess the influence of various factors on marketed surplus of milk and productivity of resources used in milk production on different categories of member and

non-member households of both the patterns so as to draw meaningful conclusions and make suggestions for rational adjustments for maximising dairy income.

Thus, the present study not only fills in information gap but also provides useful and relevant information to the policy makers, planners, administrators and the farmers who could make rational decisions for the benefit of members as well as co-operative movement in the field of dairying.

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CHAPTER III

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GENERAL BACKGROUND OF STUDY AREA

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## GENERAL BACKGROUND OF STUDY AREA

Dairying forms an important activity of the rural households in the selected Bulandshahr and Aligarh districts of Uttar Pradesh. It is carried on mostly as a subsidiary occupation with crop cultivation by the farmers. Any programme which aims at an increased milk production through improved dairying in the area will, therefore, be extremely beneficial to the entire farming community since it provides a regular and steady flow of income to the family.

After having dealt with the scope of the problem and review of relevant literature on the subject in Chapter I and II respectively, it is essential to have an idea about the background of the selected districts and the general features of the dairy co-operatives. An effort is, therefore, made here to discuss the organizational structure of the dairy co-operatives along with the general features of the districts in the following sections:

### Organisational Structure of the Dairy Co-operatives:

The organizational structure is almost uniform in all the spheres of the co-operative movement. This structure

owes its origin to the fact that all co-operative societies are founded on the same basic principles. However, the rules of the various forms of co-operative societies may vary according to their objectives and functions.

Milk co-operatives follow a clear structural pattern in the field of milk marketing as also in other fields of co-operative activities. The primary milk producers' societies consist of individual members at the village level, the primary societies federate at the district level and form a milk union while at the state level, the apex society consists of central societies (milk unions) and is known as Pradeshik Co-operative Dairy Federation (PCDF). It was observed that Operation Flood-II programme in the state was initiated in November 1982 with the main objectives of collecting milk directly from the milk producers through forming Anand pattern primary co-operative societies at the village level, making available various technical inputs to its members for the enhancement of milk production and ensuring supply of good quality milk in major towns of the state. The State level Pradeshik Co-operative Development Federation has been entrusted with the responsibility of implementing Operation Flood II programme in the state.

The functions of different societies in Uttar Pradesh functioning at different levels are described below:

Pradeshik Co-operative Dairy Federation (PCDF):

The role of PCDF encompasses all preparatory and planning work concerning the operation of the Programme. More specifically, it has the following functions:

- It plans, controls and guides the activities of the milk unions.
- It promotes co-operative principles.
- It promotes quality control of milk and milk products.
- It assists in designing, planning, construction and installation of processing plants.
- It advises on the dairy management, price policy and allied subjects relating to milk unions.
- It arranges training programmes for the members and the staff of the unions and societies.
- It adopts and undertakes any duties as may be required.

Co-operative Milk Producers' Union:

- It organizes the availability of technical inputs for its primary societies.
- It organizes dairy extension services.
- It collects the milk of the members of the society on quality basis.

- It develops milk processing and product manufacturing facilities.
- It organizes consumer oriented marketing system for milk and milk products.

Primary Co-operative Milk Producers' Societies:

- It arranges the necessary inputs such as feed, loans, fertilizers, seeds, pesticides, insecticides along with irrigation facilities for fodder development.
- It provides facilities of breeding and animal treatment.
- It organizes milk marketing facilities to the members.

It is worthwhile to mention here that neither the milk union nor milk producers' societies organised on UP Dairy Development pattern make any arrangement for providing technical inputs and artificial insemination and treatment facilities to the members.

Status of Co-operatives:

Table 3.1 shows the present position of Primary Milk Producers' Co-operative Societies, their members and coverage in the two selected districts and state. It may be observed from the table that the total number of functioning

Table 3.1 Present position of Milk Co-operatives (1981-82)

Sr. No.	Particulars	State	District	
			Buland-shahr	Aligarh
1.	Number of functioning societies	855	12	12
2.	Total Registered Pradeshik Milk Producers Co-operative Societies (1981-82)	3313	139	219
3.	Percentage of functioning societies to total societies	25.80	<del>41.58</del> 8.63	<del>92.00</del> 5.47
4.	Average member per functioning society	171.92	41.58	92.00
5.	Total number of members in the registered societies	147000	499	1104
6.	Total villages	112561	1204	1496
7.	Percentage of villages covered by functioning co-operative societies	0.75	0.99	0.80
8.	Percentage of villages covered by registered societies	2.94	11.54	14.63
9.	Total veterinary hospitals	1272	23	31
10.	Number of villages covered per Veterinary Hospital	88.50	52.34	48.25

societies in Bulandshahr and Aligarh was 12 in each district. However, the percentage of the functioning societies to total registered societies in Bulandshahr and Aligarh districts was only 9 and 5 per cent respectively as against 26 per cent in the state. The average number of members per functioning societies was only about 42 and 32 in Bulandshahr and Aligarh districts respectively as against 172 in the state as a whole. It is disquieting to note that the villages covered by the functioning societies was less than one per cent of the total villages in the districts and the state.

#### Status of Dairying:

It was observed that the total cattle and buffalo population in the state, according to Livestock Census 1978 was about 25.77 million and 13.97 million respectively (Table 3.2). It is interesting to note that the cattle and buffaloes in the state accounted for about 14.31 and 22.54 per cent of the total cattle and buffalo population in the country. However, the total milk production in the state was estimated at 6.47 million tonnes<sup>1/</sup> which accounted for 17.80 per cent of the total milk production in the country during 1983-84.

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<sup>1/</sup> Dairy India 1985 Year Book p. 69.

Table 3.2            Livestock Population  
(in thousands)

Sr. No.	Category of livestock	State	Districts	
			Buland-shahr	Aligarh
1.	Cattle			
	Male above 3 years	13634	194	185
	Female above 3 years	6650	51	49
	Calves below 2 years	5487	49	40
	Total cattle	25771	294	274
2.	Buffaloes			
	Male above 3 years	1840	39	31
	Female above 3 years	7288	263	286
	Calves below 2 years	4838	165	156
	Total buffaloes	13966	467	473
3.	Sheep and Goats	10522	64	108
4.	Horse and Ponies	242	4	5
5.	Pigs	1606	28	23
6.	Other animals	237	10	17
	Total animals	52344	867	900
7.	Hans	2513	45	47
8.	Poultry	5498	66	48

Source: Livestock Census, 1978, Central Statistical Organization, Department of Statistics, Ministry of Planning, Government of India.

It was noted that Bulandshahr and Aligarh districts have two patterns of dairy co-operatives functioning in these districts which provide a suitable background for comparative study of the patterns. It was further observed that the total breedable cow population in the Bulandshahr and Aligarh districts was about 51 and 49 thousand respectively which accounted for about 0.76 and 0.73 per cent of the breedable cow population of the state. However, the breedable buffalo population in Bulandshahr and Aligarh districts was about 263 and 286 thousand respectively accounting for about 3.60 and 3.78 per cent of the total breedable buffalo population in the state.

As regards the stocking rate in the Bulandshahr and Aligarh districts, it was observed that the average number of milch animals per hundred persons were 32.40 and 30.28 respectively. The stocking rate of milch animals per hundred hectares of cultivated area was 174.46 and 148.65 in Bulandshahr and Aligarh districts respectively.

#### General features of the districts:

Bulandshahr and Aligarh districts have geographical area of 4352 and 5019 sq. kms respectively which is about 1.47 and 1.70 per cent of the total area of the state.

According to 1981 Census, the human population of Bulandshahr and Aligarh districts was about 23.49 lakhs and 25.65 lakhs respectively (Table 3.3). This constitutes around 2.11 and 2.31 per cent of the total population of the state respectively. The density of population in Bulandshahr and Aligarh districts is considerably higher than the average density of the state as a whole. The average density of population for Bulandshahr and Aligarh districts during 1981 was 540 and 511 persons per sq. km respectively as against 377 persons per sq. km in the state. The workers in Bulandshahr and Aligarh districts accounted for 25.88 and 26.53 per cent of the total population in the districts respectively as against 29.22 per cent of the total human population in the state. Agricultural workers constituted about 18.09 and 20.07 per cent of the total working force in the Bulandshahr and Aligarh districts respectively as against 16.32 per cent in the state as a whole. However, the cultivators accounted for 52.33 and 44.70 per cent of the total working population in Bulandshahr and Aligarh districts as compared to 58.02 per cent in the state. The scheduled caste population in Bulandshahr and Aligarh districts accounted for 21.44 and 22.49 per cent of the total human population in the districts respectively as compared to 21.15 per cent in the state as a whole. The rural population of Bulandshahr and Aligarh districts accounted for 80.66 and 77.00 per cent of the total

Table 3.3 Area and population of Uttar Pradesh and selected Districts

Sr. No.	Particulars	State	Districts	
			Buland-shahr	Aligarh
1.	Area in sq. kms.	294415	4352	5019
2.	Human population (in lakh)			
	Male	588	12	14
	Female	521	11	11
	Total	1109	23	25
3.	Sex Ratio (Females per 100 males)	886	866	840
4.	Density of population (Number per sq. km.)	377	540	511
5.	Rural population as percentage to total population	82.05	80.66	77.00
6.	Literacy status (%)	27.40	28.98	31.21
7.	Total workers (%)			
	i) Cultivators	58.02	52.33	44.70
	ii) Agricultural labours	16.32	18.09	20.07
	iii) Home Industries	4.39	4.02	6.26
	iv) Others	21.27	25.56	28.97
8.	Total workers as percentage to total population	29.22	25.88	26.53
9.	Scheduled caste as percentage to total population	21.15	21.44	22.49
10.	Per capita cultivated land (ha)	0.27	0.19	0.20

Source: Census of India, 1981, Vol. I and IV. Central Statistical Organization, Deptt. of Statistics, Ministry of Planning, Government of India.

human population in the districts as against 82.05 per cent in the state.

As regards the literacy status, it was worked out to be 28.98 and 31.21 per cent in Bulandshahr and Aligarh districts respectively as against 27.40 per cent in the state as a whole.

#### Climate:

The climate of Bulandshahr and Aligarh districts is extremely hot in summer and markedly cold in winter. The temperature begins to rise towards the end of March and in the months of May and June, it rises to around 39.3 degree on the Celsius scale in these districts as reflected in Table 3.4. The minimum temperature of Bulandshahr and Aligarh districts varies in between 3.9 and 6.5 degree on the Celsius scale respectively. While the minimum and maximum temperature of Uttar Pradesh was recorded around -11 and 49 degree on the Celsius scale during 1981-82 (Table 3.4).

Table 3.4 Rainfall and Temperature during 1981-82

State/District	Av. Rainfall (M.M)		Temperature (°C)	
	General	Actual	Minimum	Maximum
Uttar Pradesh	977	948	(-11.00)	45.8
Bulandshahr	657	478	3.9	39.2
Aligarh	663	640	6.5	39.3

Monsoon usually sets in by the first week of July and continues till the end of September. The months of July, August and September together account for over 50 per cent of the total annual rainfall. Heavy rains are generally recorded during July and August months.

The table further shows that the actual rainfall of the Bulandshahr and Aligarh districts during 1981-82 was estimated at 478 and 640 millimeters respectively.

#### Land Utilization:

The land utilization pattern in Bulandshahr and Aligarh districts is presented in Table 3.5. It may be observed from the table that about 78.21 and 77.29 per cent of the total reported area in Bulandshahr and Aligarh districts was under plough respectively as against 58.19 per cent in the state. The forest covered only 2.29 and 1.59 per cent of the area to total area in Bulandshahr and Aligarh districts respectively as against 17.25 per cent in the State. The total cropped area in Bulandshahr and Aligarh was 574 and 641 thousand hectares respectively which gave a cropping intensity of about 168 and 165 per cent as against 145 per cent for the state as a whole.

#### Operational Holdings:

Land is one of the most important factors for measuring the size of farm business in an agrarian economy. Land

Table 3.5 Land Utilization Pattern in the Selected Districts and State (1981-82)

Sr. No.	Particulars	(In thousand)		
		State*	District **	
			Guland-shahr	Aligarh
1.	Total reported area	29709 (100.00)	436 (100.00)	502 (100.00)
2.	Forest	5126 (17.25)	10 (2.29)	8 (1.59)
3.	Saline/Alkaline and uncultivable area	1121 (3.77)	16 (3.68)	32 (6.37)
4.	Other utilization except cultivation	2322 (7.83)	36 (8.26)	38 (7.58)
5.	Cultivated waste land	1122 (3.77)	10 (2.29)	11 (2.19)
6.	Permanent pasture	287 (0.99)	1 (0.23)	2 (0.40)
7.	Area under trees, gardens which are not included in cultivated area	599 (2.04)	2 (0.46)	1 (0.20)
8.	Current fallow	1099 (3.69)	12 (2.75)	11 (2.19)
9.	Other fallow	734 (2.47)	8 (1.83)	11 (2.19)
10.	Not sown area	17289 (58.19)	341 (78.21)	388 (77.29)
11.	Area sown more than once	7484	253	253
12.	Total cropped area	24773	574	641
13.	Cropping intensity	143.28	168.32	165.20

Source \* Statistical Dairy, Uttar Pradesh, 1983, Economics and Statistical Division, State Planning Institute, Uttar Pradesh.

\*\* District Statistical Patrika, 1983, Economics and Statistical Division, State Planning Institute Uttar Pradesh

Figures in parentheses indicate percentage to total/reported area.

essentially plays a vital role in the economy of cultivators. It is, therefore, important to study the distribution of operational holdings in the districts and state.

Table 3.6 shows the distribution of land holdings in the districts and state. It may be observed from the table that the marginal farms (below 1 hectare) in Bulandshahr and Aligarh districts accounted for about 56 and 50 per cent of the total operational holdings as against 69 per cent in the state. However, small farms (between 1.0 and 2.00 hectares) in Bulandshahr and Aligarh districts accounted for about 21 and 22 per cent of the total operational holdings in the districts respectively as against 16 per cent in the state as a whole. It may be observed from the table that nearly 77 and 72 per cent of the total operational holdings were upto 2 hectares in Bulandshahr and Aligarh districts respectively which handled only about 37 and 32 per cent of the total operated area in these districts. On the other hand, there were 12 and 17 per cent of the operational holdings above 3 hectares in Bulandshahr and Aligarh districts respectively cultivated about 45 and 52 per cent of the total operated area in the districts. This indicated a wide disparity in the distribution of land holdings in the selected districts. The average size of operational holdings in Bulandshahr and Aligarh districts was 1.38 and 1.65 hectares respectively as against 1.05 hectare in the state.

Table 3.6 Distribution of operational holdings and Operated Area in Uttar Pradesh and Selected Districts

Size of holdings (ha)	Number of operational holding		Operated Area		Average size of holding (ha)
	In 000,	% to total	In 000,	% to total	
<u>State</u>					
Less than 1 ha	11773.4	69.37	4263.9	23.87	0.36
1.0 - 2.0	2781.4	16.39	3854.9	21.58	1.38
2.0 - 3.0	1096.9	6.46	2632.1	14.75	2.59
3.0 - 5.0	831.8	4.90	3136.8	17.56	3.77
5.0 - Above	487.7	2.88	3972.7	22.24	8.14
Overall	16971.2	100.00	17860.4	100.00	1.05
<u>Bulandshahr</u>					
Less than 1 ha	136.8	56.12	58.1	17.18	0.42
1.0 - 2.0	52.2	21.43	68.5	20.24	1.31
2.0 - 3.0	24.3	9.99	58.5	17.28	2.40
3.0 - 5.0	20.3	8.28	76.6	22.63	3.79
5.0 - Above	10.2	4.18	76.7	22.67	7.52
Overall	2439.0	100.00	338.6	100.00	1.38
<u>Aligarh</u>					
Less than 1 ha	117.8	50.52	50.03	13.02	0.42
1.0 - 2.0	50.6	21.71	72.00	18.75	1.42
2.0 - 3.0	25.7	11.05	62.6	16.30	2.43
3.0 - 5.0	24.6	10.56	93.9	24.45	3.81
5.0 - Above	14.3	6.16	105.6	27.48	7.35
Overall	232.2	100.00	384.2	100.00	1.65

### Cropping Pattern:

The Bulandshahr and Aligarh districts are known as the grainery of Uttar Pradesh. It may be observed from Table 3.7 that wheat and maize in Bulandshahr district and wheat and bajra in Aligarh district are the principal cereal crops which account for about 56 and 49 per cent of the total cropped area in Bulandshahr and Aligarh districts respectively. However, paddy and wheat are the main cereal crops in the state accounting for about 53 per cent of the total cropped area.

It was further observed that the food grain crops accounted for about 72 and 82 per cent of the total cropped area in Bulandshahr and Aligarh districts respectively as against 62 per cent in the state as a whole. Sugarcane crop was the most prominent cash crop of the Bulandshahr district and accounted for about 13 per cent of the total cropped area in the district. Besides, sugarcane, oilseeds and potato were the other significant cash crops.

### Crop Productivity:

It may be observed from Table 3.8 that the average productivity of wheat crop was 24.60 and 23.41 qtl per hectare in Bulandshahr and Aligarh districts respectively as against only 16.40 qtl in the state. The per hectare

Table 3.7 Cropping Pattern  
(Area in '000' hectares)

Sr. No.	Crops	State		Districts			
		Area	Per-centage to total	Bulandshahr		Aligarh	
				Area	Per-centage to total	Area	Per-centage to total
<b>1. Cereals</b>							
	Paddy	5589	21.75	8.79	1.56	12.98	2.03
	Wheat	7772	31.37	205.50	35.88	197.58	30.83
	Barley	686	2.76	26.33	4.59	50.96	7.96
	Jowar	686	2.76	4.26	0.77	1.50	0.23
	Bajra	974	3.97	25.16	4.38	113.71	17.73
	Maize	1174	4.72	116.51	20.29	54.90	8.56
	Other cereals	492	1.98	-	-	-	-
	Total cereals	17175	69.31	386.60	67.35	451.66	67.34
<b>2. Pulses</b>							
	Urd	227	0.91	1.07	0.18	1.48	0.23
	Moond	144	0.58	5.77	1.00	41.65	4.93
	Arhar	516	2.08	4.57	0.79	9.7 <sup>24</sup>	1.44
	Gram	1571	6.34	8.26	1.61	22.58	3.52
	Other pulses	589	2.37	8.19	1.42	28.67	4.47
	Total food grains	20220	81.61	415.48	72.38	525.30	81.95
<b>3. Oil seeds</b>							
	Lehi+ Mustard	858	3.46	7.25	1.26	25.72	4.01
	Groundnut	460	1.85	6.50	1.13	25.07	3.91
	Other oil seed crops	261	1.05	0.01	0.003	0.45	0.06
		137	0.55	0.72	0.12	0.24	0.04
<b>4. Cash crops</b>							
	Sugarcane	1990	8.03	76.60	13.34	29.81	4.65
	Potato	1652	6.66	64.78	11.28	16.85	2.62
	Tobacco	288	1.16	7.80	1.35	5.67	0.88
	Cotton	12	0.04	0.14	0.02	0.16	0.02
		30	0.12	3.86	0.67	7.11	1.10
<b>5. Other crops</b>							
		1713	6.91	74.66	13.02	60.16	9.38
<b>Total cropped area</b>		<b>24773</b>	<b>(100.00)</b>	<b>574</b>	<b>(100.00)</b>	<b>641</b>	<b>(100.00)</b>

Note: Other crops here include different vegetable, millets, jute etc.

Table 3.8 Production and Productivity of Major Crops (1981-82)

Sr. No.	Crops	State		Bulandshahr		Aligarh	
		Production in '000' tonnes	Productivity in qtl/ha	Production in '000' tonnes	Productivity in qtl/ha	Production in '000' tonnes	Productivity in qtl/ha
<b>1. Cereals</b>							
	Paddy	5898	10.90	5.80	6.59	8.85	6.81
	Wheat	12749	16.40	505.65	24.60	462.54	23.41
	Barley	744	10.80	31.39	11.91	77.80	15.29
	Jowar	605	8.80	0.17	0.39	0.44	2.93
	Bajra	679	6.90	17.86 <sup>56</sup>	6.97	91.53	8.04
	Maize	1004	8.50	173.72	14.91	39.14	7.12
	Others	347	7.00	-	-	-	-
	Total cereals	22026	12.60	734.31	18.99	680.34	15.76
<b>2. Pulses</b>							
	Urd	72	3.20	0.39	3.64	0.32	2.16
	Moong	59	4.10	2.47	4.28	9.74	3.07
	Arhar	630	12.20	5.34	11.68	6.19	6.69
	Gram	1062	6.70	4.24	4.57	20.18	8.93
	Other pulses	445	7.60	7.14	8.71	32.07	11.18
	Total pulses	2268	7.40	19.59	6.78	70.17	7.49
	Total food grains	24294	12.00	753.90	18.14	750.51	14.28
<b>3. Oil seed crops</b>							
	Lahi Mustard	1079	23.45	4.13	6.35	17.83	7.11
	Groundnut	254	9.73	0.01	5.55	0.20	4.60
	Other oil crops	146	10.80	0.09	1.23	0.03	1.20
	Total oil seed crops	1481	17.26	4.24	5.84	18.06	7.02
<b>4. Cash crops</b>							
	Sugarcane	76440	462.71	3024.58	466.90	851.19	505.15
	Potato	4380	152.20	170.78	218.94	86.47	152.50
	Tobacco	15	12.50	0.16	11.42	0.18	11.18
	Cotton	4	1.33	0.49	1.26	0.90	1.26
	Jute	14	17.50	0.002	20.00	0.03	16.66

yield of paddy was about 7 qtl in both the districts as compared to 11 qtl in the state. Per hectare yield of gram in Aligarh and that of Arhar in Bulandshahr were observed to be better as compared to other district as well as the state. The perusal of the table further revealed that there was enough scope to increase per hectare yields of various crops through the adoption of new technology in the study area.

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CHAPTER IV

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METHODOLOGY

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## METHODOLOGY

This chapter deals with the selection of the study area, sampling design, selection of households, concepts of various terms used and procedures followed for the estimation of different parameters pertaining to marketed surplus, productivity of milch animals, cost and returns in dairy enterprise, specification of various economic and mathematical models including that of variables used in the regression analysis.

### Selection of Study Area:

There is ample evidence to suggest that the western Uttar Pradesh is relatively more progressive area in the context of resource endowments and agro-climatic factors which have shown positive impact on the productivity of crop and dairy animals in the recent past. Therefore, this area is stated to be having higher milk production potential as compared to other parts of the state. Besides, the investigator belongs to western Uttar Pradesh and is well conversant with the local language, problems and felt needs of the milk producers of the area. Keeping the above stated points in view, Western Uttar Pradesh was selected for the present study.

### SAMPLING DESIGN:

Commensurate with the objectives of the study, the multi-stage stratified random sampling technique was used. The sampling process in the study consists of three stages viz., selection of the districts, selection of dairy co-operatives and selection of households which have been discussed as under:-

#### Selection of Districts:

The selection of districts for the present study formed the first stage in the sampling design. It was observed that the districts of Bulandshahr and Aligarh were the parts of the different milk-shed areas. The Dairy Co-operatives established in these districts were managed and supervised by Juguh Utpadak Sahakari Sangh (U.U.S.S.) Ltd. It is worthwhile to mention here that milk co-operatives set up in Bulandshahr district were organised on Anand pattern which supply milk to Delhi Milk Scheme whereas the co-operatives in Aligarh district were set up on U.P. Dairy Development Programme Pattern (UP Pattern) and supply milk to Glaxo Laboratories (India) Ltd. at Aligarh.

In order to have comparative picture of problems,

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The UP Dairy Development Programme Pattern has been used as UP Pattern in this study for convenience sake.

performance and impact of these co-operatives. Bulandshahr and Aligarh districts were purposively selected which provided suitable background for the present study.

#### Selection of Dairy Co-operatives:

The selection of the dairy co-operatives formed the second stage of sampling. The secondary information collected from D.U.S.S. revealed that the total number of primary co-operative milk producers' societies in Aligarh and Bulandshahr districts was 219 and 139 respectively. It was observed that only 39 and 30 societies in Aligarh and Bulandshahr respectively were functioning during 1981-82. However, out of these functioning societies, only 12 societies in each district had been functioning continuously for the last five years. These societies were classified into three categories viz., efficient, less efficient and non-efficient with the help of composite index prepared on the basis of number of members, milk procurement and profit and loss of the society. Based on the above criteria, three co-operative societies of each type were randomly selected from both the districts. Thus, in all, 3 primary co-operative milk producers' societies from Bulandshahr district and 3 from Aligarh district were finally selected for the present study.

### Selection of Households:

The selection of households was the most important step and formed the third stage of sampling in the present study. Therefore, a complete enumeration of all the members of the selected societies, belonging to different categories of households viz., landless labour having no land, marginal farmers owning land upto one hectare, small farmers with 1.01 hectare to 2 hectares, medium farmers with 2.01 hectare to 4 hectares and large farmers with more than 4 hectares, was done. Thus, twenty households from each society were randomly selected based on probability proportional to the number of households in each category keeping a minimum of two households in each category.

In order to compare and study the impact of dairy co-operatives, a sample of 60 non-member milk producers were also selected following the same criterion as adopted for the selection of member households. Thus, in all, the study included 180 households of different categories from the two districts (120 member households and 60 non-member households) which is shown in Table 4.9

### Method and Period of Enquiry:

Data relating to various aspects of dairy and crop

Table 4.8 Selection and Distribution of Sample Households across categories

Category of households	Anand pattern			U.P. pattern			Overall	
	Members	Non-	members	Members	Non-	members	Members	Non-
	Total	Select-	ad	Total	Select-	ad	Total	Select-
Landless labour	52	27	14	135	18	9	45	23
Marginal farmers	32	15	7 6	86	12	6	27	13
Small farmers	12	6	3	70	9	5	15	8
Medium farmers	18	6	3	123	15	7	21	10
Large farmers	12	6	3	38	6	3	12	6
Overall	121	60	30	452	60	30	120	60

enterprises were collected in the well structured and pre-tested schedule by survey method. Each of the sample households was visited personally by the researcher for interviewing the head of the family. This micro-level investigation based on cross-section data related to the agriculture year 1981-82.

Data collection:

For the present study, two types of data were collected, viz. secondary and primary whose details are given below:

Secondary data: Commensurate with the objectives of the study, secondary data for the period from 1976-77 to 1981-82 on various aspects of dairy co-operatives were collected from Dugdh Utpadak Sahakari Sangh (DUSS) of both the selected districts. The detailed information regarding number of members of different categories, procurement and supply of milk by the co-operatives, annual profit and loss, monthwise price of milk paid to the members, organizational structure and functioning of the society along with the problems of members and the functionaries of the societies were collected.

Primary data: The relevant primary data from the selected respondents regarding family composition, investment

in dairy and crop farming, monthwise production, consumption and marketed surplus of milk, resource use pattern, human labour use in dairy enterprise along with the prices of inputs and outputs (Appendix 1) were collected in a properly designed schedule. Data on problems of members, organization and functioning of the society were also obtained through a different set of questionnaire.

#### Analytical Framework:

The methodology employed to achieve various objectives of the study is discussed in the following two sections of the tabular and regression analysis.

#### Tabular Analysis:

Tabular analysis of data, collected from the 120 members of the societies and 60 non-members, was done for drawing inferences and examining the impact of dairy co-operatives on resource use pattern and productivity of milch animals, production, consumption and marketed surplus of milk, employment and income levels in dairy enterprise on different categories of the sample households.

#### Regression Analysis:

The objective of resorting to multiple regression analysis is to examine relationship between various inputs

and output in dairying and worked out marginal productivities of relevant inputs so as to suggest rational adjustment in dairy enterprise and to analyse various factors affecting the marketed surplus of milk for drawing useful inferences. Such an information would be useful to the farmers in making rational decisions about the use of scarce resources and sale and consumption of milk on the farms. Multiple regression analysis by classical least square method was done to achieve the above stated objectives. With this end in view, marketed surplus and productivity models were developed. Thus, seasonal marketed surplus and seasonal milk production functions were fitted to the data.

#### Specification of Economic Model:

Formulation of an economic model for marketed surplus and milk production functions by and large depends upon and fit into the physical, biological and economic logic. For empirical research, the models have to be not only logically sound but also computationally feasible.

#### Marketed Surplus Model:

The marketed surplus of milk on different categories of households in different seasons was postulated to be

influenced by various factors like production of milk per household, monthly disposable income of the household, family size, educational score of the family, price of milk and average value per milch animal. Thus, the economic model was of the following specifications:

$$Y = f (\lambda_1, \lambda_2, \dots, \lambda_n)$$

where,

$Y$  = Marketed surplus of milk per household per day in litres during a season,

$\lambda_1$  = Production of milk per household per day in litres during a season,

$\lambda_2$  = Average monthly disposable income of the household during the season,

$\lambda_3$  = Family size of the household,

$\lambda_4$  = Educational score of the household,

$\lambda_5$  = Price of milk per litre during a season,

$\lambda_6$  = Average value per milch animal in rupees.

#### Milk Production Function:

In case of milk production functions, the milk yield from buffalo only <sup>\*/</sup> in different seasons was postulated to be influenced by various factors like green fodder, dry fodder, concentrate, human labour cost, veterinary expenses,

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<sup>\*/</sup> The cow milk production functions could not be fitted to the data due to insufficient number of observations pertaining to local cow.

value of animal, order of lactation and stage of lactation.  
This economic model was of the following specification:

$$Y = f (\lambda_1, \lambda_2, \dots, \lambda_n)$$

Where,

- Y = Milk yield per animal per day in litres during the season,
- $\lambda_1$  = Green fodder fed per animal per day in rupees during a season,
- $\lambda_2$  = Dry fodder fed per animal per day in rupees during a season,
- $\lambda_3$  = Concentrate fed per animal per day in rupees during a season,
- $\lambda_4$  = Human labour cost per animal per day in rupees during a season,
- $\lambda_5$  = Veterinary expenses per animal per day in rupees during a season,
- $\lambda_6$  = Value of animal in rupees,
- $\lambda_7$  = Order of lactation,
- $\lambda_8$  = Stage of lactation.

#### Selection and Specification of Variables:

In order to depict the marketed surplus and milk production functions correctly, the choice of variables should be made in terms of underlying mechanics. The selection of relevant variables to be included should be based on prior experience and should not be contrary to any of the physical,

biological and economic logic. Therefore, appropriate selection and specification of variables are essential step in this direction with a view to isolating and identifying the relationships of various independent variables with dependent variable in different seasons. In order to fit seasonal functions, the year was decomposed into three seasons viz., rainy (July to October); winter (November to February) and summer (March to June ). The brief description of the selected variables in the marketed surplus function is given below:

Dependent Variable:

\* Quantity of milk sold was stipulated to be dependent variable in the marketed surplus model. The average daily quantity of milk sold during different seasons was worked out from the monthly figures of milk sale recorded in the schedule of the individual household and was taken as dependent variable in the model.

Independent Variable:

Marketed surplus of milk is influenced by several factors which were considered to be responsible for affecting variation in the marketed surplus of milk which are discussed below:

1) Production of Milk: - The average daily milk yield during different seasons was worked out from the monthly figures of milk yield given by the lactating animals on the households.

Disposable Income: - Disposable income is considered an important variable which influences the consumption of milk and in turn affects the marketed surplus. Friedman <sup>\*</sup>/ was of the view that expenditure patterns are set by permanent income. Disposable income was, therefore, calculated for agriculture occupation group. All gross receipts from dairy enterprises were pooled and the operating costs were deducted from the gross receipts. Again from this, depreciation on the capital assets, interest on the value of fixed assets, wages of permanent labour, land revenue were deducted to work out the disposable income of the household.

Family Size: - A person who participated in the common kitchen and stayed at least 16 days in a month preceding the period of enquiry was treated as a member of the family <sup>\*\*</sup>/. The total number of members in the family irrespective of

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<sup>\*</sup>/ M. Friedman, A theory of consumption function, Princeton, N.J., Princeton University Press, 1957

<sup>\*\*</sup>/The National Sample Survey Report: Eleventh and Twelfth round, August 1956, August 1957, No.87 - Table with notes The Cabinet Secretary, Govt. of India, New Delhi, 1964- p.5.

their age and sex constituted the variable of family size.

Educational Score: - The scale prepared by Trivedi (1963) \* / to measure the educational status of rural families was used whose details are given below:

Level of Education	Weightage
Illiterate	0
Can read only	1
Can read and write	2
Primary	3
Middle	4
High School	5
Graduate	6

$$\text{Educational level of family} = \frac{\sum E_i n_i}{n_i}$$

Where,  $n_i$  is the members in the  $i^{\text{th}}$  category of the education and  $E_i$  is the scale of the  $i^{\text{th}}$  educational level.

Price of milk: The average prevailing market rates of milk in the sample pockets were taken as price of milk at which milk producers disposed-off their milk to different procurement agencies in different seasons.

\* / Trivedi, G. (1963) Measurement of analysis of socio-economic status of rural families (A study conducted in C.D. Block Kanjhauli Block Delhi State) Unpublished Ph.D. thesis (Indian Agricultural Research Institute, New Delhi)

Average Value per milch Animal: - The average value per milch animal was calculated from total value of milch animal divided by number of milch animals maintained on the sample households and used as a separate variable.

### Productivity Model

Dependent Variable: - Milk yield was stipulated to be dependent variable in this model. The average daily milk yield during different seasons was worked out from the monthly figures of the milk yield recorded by the lactating animals and was taken as dependent variable.

Independent Variable: - Milk yield is influenced by several factors which are considered responsible for effecting variation in the milk yield, the same are discussed as under:

Green fodder: - The value of the average quantity of green fodder fed to an individual lactating animal per day in the season was worked out and is taken as an independent variable.

Dry fodder: - The value of the average quantity of dry fodder fed to an individual lactating animal per day in the season was worked out and is taken as an independent variable.

Concentrate: - The value of the average quantity of concentrate fed to an individual lactating animal per day in the season was computed and is taken as an independent variable.

Human Labour Cost: - The total human labour actually used in various dairy operations for the maintenance of dairy animals was estimated and converted into man-equivalent hours per day in each season and multiplied with prevailing wage rate. Thus, the cost of human labour per day per lactating animal was computed and is taken as an independent variable.

Veterinary Expenses: - The variable of veterinary expenses constitute the cost incurred on artificial insemination, vaccination and veterinary medicines including their administration. The average cost incurred was worked out for the animal per day in each season and taken as an independent variable.

Value of Milch Animal: - The actual market value of the animal was taken as a separate variable.

Order of Lactation: - The number of running lactation after calving of the animal was taken as the lactation order of the animal.

Stage of Lactation: - The number of days that the animal has been in milk after calving in the running lactation order denotes the lactation stage.

Choice of Algebraic form: - The algebraic form of the marketed surplus and milk production functions and the

magnitudes of their regression coefficients vary with the change of environment, resource use pattern, type of breed, household income, family size, educational score, price of milk etc. Therefore, selection of mathematical model should be consistent with phenomena under investigation, keeping in view the experience gained through previous investigations. The following algebraic forms of functions were tried in the present study:

$$i) \quad Y = a + b_1 \lambda_1 + U_1 \dots \dots \dots (1)$$

ii) Cobb-Douglas:

$$\text{Log } Y = \text{Log } a + b \text{ Log } \prod_{i=1}^n \lambda_i + U_1 \dots \dots (ii)$$

iii) Semi Log

$$Y = \text{Log } a + b \text{ Log } \prod_{i=1}^n \lambda_i + U_1 \dots \dots \dots (iii)$$

Where,

'Y' is the dependant variable and ' $\lambda_i$ ' are the independent variables, 'n' is the total number of explanatory variables, 'a' is the intercept term and ' $U_1$ ' is the random disturbance term independently distributed with zero-mean and finite variance and 'b' are the regression coefficients.

#### Step Followed in Functional Analysis:

In the first attempt, various types of production functions, namely, linear, Cobb-Douglas and semi-log were fitted to the data pertaining to categories of households in

different seasons. Separate regression analysis was done for member and non-member households to compare the factors influencing the marketed surplus of milk and to see the efficiency of different variables. To examine the extent of multicollinearity, simple correlation matrices for the given variables were worked out for both types of pattern of the societies and for different categories of households in various seasons which are given in Appendix 2-98. High degree of correlation among the explanatory variables give rise to the problem of multicollinearity which was appropriately dealt with. However, it was observed through the examination of correlation matrices that multicollinearity did not exist in the fitted regression equations.

#### Estimation of Marginal Productivity:

Marginal physical product (MPP) of an input is the increase in output forth coming from the use of an additional unit of input, the levels of other inputs remaining constant. In a linear model regression coefficient ( $b_i$ ) of the independent variables are the marginal physical products

$$\text{MPP} = b$$

2) In case of Cobb-Douglas Model, the elasticity ( $b_{1s}$ ) of inputs multiplied by the ratio between mean value of output and mean value of independent variables are the marginal

Physical products:

$$MPP = b \frac{Y}{X}$$

3) In case of semi-log production function, the MPP is the ratio between the regression coefficients ( $b_1$ ) and mean value of independent variables:

$$MPP = \frac{b}{X}$$

Marginal Value Product:

The marginal value products (MVP) of the inputs were obtained by multiplying the MPP of each input by the price of the product. Mathematically, it can be written as  $MVP = MPP (X) \times \text{price of output (Milk)}$ . The MVP, thus, obtained were compared with their respective prices. In a perfectly competitive market, if MVP of any input is lower than its price, it indicates the excessive use of the input that needs to be reduced to the optimum level at which the MVP coincides to its price and this quantity of input maximises the economic efficiency.

Concepts and Estimation Procedures:

The concepts of various terms used and estimation procedures followed are discussed below:

### Fixed Cost:

Fixed costs refer to those costs which remain unchanged over the short period of time. Fixed cost computed in the present study included depreciation on fixed assets, like animals, cattle-shed, stores for feed and fodder and dairy equipments, interest on fixed capital and insurance premium, if any.

### Depreciation:

Depreciation is a loss of value of an asset due to its use and time. It represents the amount by which a farm asset decreases in value. In case of milch animals, no depreciation was charged upto the third lactation order. However, on fourth and fifth lactation order, ten percent depreciation was charged for the animals while twenty percent depreciation was charged for the animals in sixth lactation and above <sup>\*/</sup>. Annual depreciation on cattle-shed, stores and equipments was calculated by straight line method. The investment in cattle-shed, stores etc. was apportioned for dairy and crop enterprises on the basis of standard animal unit (SAU)<sup>\*\*/</sup> and then depreciation on these assets in dairying was worked out and allocated for the milch animal.

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<sup>\*/</sup> Patel, K.K. "Evaluation of Livestocket organised farm". Dairy Hand Book (Production), N.D.R.I., Karnal, November 1979.

<sup>\*\*/</sup> for details about Standard animal units see Appendix 19.

### Interest on Fixed Capital:

Interest on fixed capital assets including the animals was worked out at the rate of 10 per cent per annum. This rate of interest on the fixed investment was charged on the assumption that if cattle owners had invested their funds in term deposits for a period of five years. They could have earned 10 per cent interest from the bank. However, no interest was charged on working capital on the assumption that owner can realize the income from sale of milk and milk products as soon as he invests the money in dairy enterprises.

### Variable Costs:

Variable costs are those costs which vary with the level of production. In making production decisions in the short run, only variable costs need to be considered which included here the cost of feeds and fodders, human labour and miscellaneous items.

### Cost of Feeds and Fodders:

Information on quantity of feeds and fodders actually fed per day to each animal in different months of the year was obtained from the owners and prevalent market rates were used for purchased and home grown feeds and fodders to work out the cost on each item.

Human Labour:

The human labour used for the maintenance of the dairy animals was recorded on the basis of actual time devoted in different dairy operations. The cost of hired labour was computed according to the prevalent wage rates for labour. The cost of family labour was, however, computed on the basis of wages provided to the permanent labour in the area. All types of labour viz., male, female and child used in different dairy operations was converted into man-equivalent days. A man-day of 8 hours was taken as equivalent to 1.6 women work day and 2 work days of the child.

Miscellaneous Expenditure:

Miscellaneous expenses were incurred on the minor repairs of cattle-shed and dairy equipments, grazing charges, veterinary medicines including charges for artificial insemination and vaccination. The joint costs incurred were apportioned for dairy enterprises and allocated on the basis of standard animal unit.

Income Concepts:

There are several measures of dairy income but the choice of measures depends upon the <sup>purpose</sup> ~~degree~~ of the study.

In the present study, gross returns, net income and family labour income have been worked out for different categories of households during different types of milch animals.

Gross Income:

The gross income from dairy enterprise was worked out by multiplying the quantity of milk produced by average price of milk.

Net Income:

Net income from dairy enterprises is the difference between gross returns and gross cost including the imputed cost of unpaid family labour.

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CHAPTER V

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RESULTS AND DISCUSSION

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## RESULTS AND DISCUSSION

Commensurate with the objectives of the study, this chapter deals with the results of the analysed data and discussion thereon in the two sections. The first section comprises the discussion based on tabular analysis of data collected from the sample house-holds. Various aspects discussed in this section pertain to the socio-economic profile of the sample households, organizational and operational problems of dairy co-operatives, utilization of land, labour and capital, productivity of milch and lactating animals, production, consumption and marketed surplus of milk, employment and income levels in dairy and crop enterprises on the member and non-member house-holds. It is worthwhile to mention here that two way comparison of various parameters between members of Anand and U.P. Pattern societies as well as between members and non-members combining both the patterns has been made so as to examine the impact of dairy co-operatives and comparative performance of the two patterns. The second section reports the results of the regression analysis done for ascertaining the factors influencing marketed surplus and milk yields on different categories of households.

## 5.1 Socio-Economic Profile of the Households:

In order to study the socio-economic status of the sample households, data on various parameters, such as family size and composition, literacy status, caste structure, size of operational holdings, distribution of milch animals on different categories of households were analysed and are discussed in the sub-sections that follow:

### 5.1.1 Family Size and Composition:

The composition and size of family, are the important factors that affect the size of dairy enterprise which is found to be a family labour based occupation in rural areas. Therefore, the average size of family, sex-wise break-up and sex ratio of the sample households were worked out and are given in Table 1.

It may be observed from Table 1 that contrary to the old held belief, the family size did not have any relationship with farm size. The overall average size of family on member and non-member households was about 6 and 5 persons respectively. The same situation existed in case of U.P. pattern. However, there was marked difference in the size of family of member and non-member households in the Anand pattern. It was further noted that the average number of milch was higher in both the groups of households and patterns. This indicated that more working hands were available for work on the farms. It was

Table 1 Family size, Composition and Sex Ratio

Category of households	Members				Non-members					
	Average family size	Composition		Sex Ratio	Average family size	Composition		Sex Ratio		
1	2	Male	Female	3	4	5	6	7	8	9
		<u>Urban Pattern</u>								
Landless Labour	5.88	3.40 (57.86)	2.48 (42.14)	728	5.06	2.71 (55.07)	2.35 (41.93)			868
Marginal	5.00	2.78 (54.66)	2.27 (45.34)	829	4.86	2.57 (52.94)	2.29 (47.06)			888
Small	5.00	4.33 (61.80)	2.67 (38.10)	615	5.00	3.00 (60.00)	2.00 (40.00)			666
Medium	4.88	2.66 (61.88)	1.66 (38.47)	628	4.67	2.67 (57.14)	2.00 (42.86)			750
Large	5.50	3.33 (60.00)	2.17 (29.40)	650	6.67	4.00 (60.00)	2.67 (40.00)			666
Overall	5.58	3.28 (58.20)	2.35 (41.80)	717	5.13	2.88 (55.93)	2.50 (44.08)			811

(Table....continued)

(Table 1 ...continued)

	1	2	3	4	5	6	7	8	9
<u>U.F. Pattern</u>									
Landless labour	5.66		2.66 (47.05)	3.00 (52.95)	1125	5.00	2.56 (51.11)	2.44 (48.89)	956
Marginal	6.75		3.60 (53.08)	3.15 (46.92)	883	4.83	2.33 (48.22)	2.50 (51.73)	1071
Small	5.11		2.78 (54.34)	2.33 (45.66)	840	6.20	3.60 (58.06)	2.60 (41.94)	722
Medium	6.46		3.66 (56.70)	2.80 (43.30)	763	5.71	2.57 (45.00)	3.14 (55.00)	1222
Large	8.66		4.33 (50.00)	4.33 (50.00)	1000	7.00	4.33 (61.90)	2.67 (38.10)	615
Overall	6.30		3.28 (52.11)	3.02 (47.89)	918	5.53	2.87 (51.80)	2.66 (48.19)	930
<u>Overall</u>									
Landless labour	5.80		3.11 (53.63)	2.69 (46.37)	864	3.57	1.90 (53.50)	1.67 (46.50)	868
Marginal	5.77		3.11 (53.84)	2.66 (46.16)	1214	4.84	2.46 (50.79)	2.42 (49.21)	968
Small	5.86		3.40 (57.95)	2.46 (42.05)	725	5.75	3.38 (58.69)	2.37 (41.31)	703
Medium	5.85		3.38 (57.72)	2.47 (42.28)	732	5.40	2.60 (48.14)	2.80 (51.86)	1076
Large	7.08		3.83 (54.11)	3.25 (45.89)	847	6.83	4.17 (60.97)	2.66 (39.03)	640
Overall	5.94		3.27 (54.97)	2.67 (45.03)	895	5.30	2.85 (53.77)	2.45 (46.23)	859

Figures in parentheses indicate the percentages.

observed that there was wide disparity in the sex ratios (number of females per 1000 males) not only on member and non-member households but also between various categories of households in both the patterns. The overall average sex ratio was 895 and 859 on the member and non-member households respectively as compared to the sex ratio of 933 in 1981 in the country.

#### 5.1.2 Literacy Status:

The literacy status of the members in the household affects the farmer's response to improved technology and practices as more enlightened and progressive farmers are supposed to be more responsive. This is especially true of dairy farming which warrants a better quality of managerial inputs than ordinary crop farming. The percentage distribution of households according to their literacy status was, therefore, computed for different categories of households and is given in Table 2.

The perusal of Table 2 reveals that much variation was discernible in the literacy status of member and non-member households in Anand and U.P. patterns. However, the overall average literacy status on member and non-member households was almost the same (47 per cent) as

Table 2: Literacy Status across Categories of Sample Households.

Category of households	( in percentage )									
	Members					Non-members				
	Illiter- ate.	Upto V	Below Second- ary	Second- ary.	Above Second- ary	Illiter- ate.	Upto V	Below Second- ary	Second ary	Above Second- ary
1	2	3	4	5	6	7	8	9	10	11
	<u>Anand Pattern</u>									
Landless labour	54.37	18.75	18.75	6.25	1.88	67.14	17.14	4.29	8.57	2.86
Marginal	58.66	20.00	18.66	1.34	1.34	58.83	29.41	11.76	-	-
Small	46.34	14.63	21.95	4.88	12.20	66.66	13.33	6.68	13.33	-
Medium	23.07	30.77	23.07	11.54	11.55	78.57	7.14	-	7.14	7.15
Large	13.33	16.67	30.00	16.67	23.33	40.00	30.00	-	5.00	25.00
Overall	48.20	19.28	20.48	6.32	5.72	62.74	20.26	5.23	6.54	5.23
	<u>U.P. Pattern</u>									
Landless labour	75.00	13.46	8.65	1.92	0.97	75.55	8.88	11.11	2.23	2.23
Marginal	79.01	9.88	7.40	3.71	-	55.17	17.24	17.24	10.35	-
Small	39.58	22.92	25.00	6.25	6.25	20.00	30.00	30.00	13.33	6.67
Medium	35.05	19.59	26.80	13.40	5.16	32.50	27.50	20.00	2.50	17.50
Large	44.90	12.24	26.53	12.24	4.09	18.18	22.22	22.72	18.18	18.20
Overall	57.26	15.30	17.41	7.12	2.91	43.98	20.48	19.27	7.83	8.44

(Table ..... continued)

(Table 2 ..... continued)

	1	2	3	4	5	6	7	8	9	10	11
					<u>Overall</u>						
Landless labour	62.50	16.66	14.77	5.54	1.53	70.43	13.91	6.96	6.08	2.62	
Marginal	69.23	14.74	12.82	2.56	0.65	57.14	23.80	14.29	4.77	-	
Small	42.70	19.12	23.59	5.61	8.98	35.55	24.44	22.22	13.33	4.46	
Medium	32.52	21.95	26.01	13.00	6.52	44.44	22.22	14.81	3.70	14.83	
Large	32.91	13.92	27.86	13.92	11.39	28.57	26.19	11.90	11.90	21.44	
Overall	53.02	17.16	18.85	6.75	4.22	52.98	20.37	12.54	7.21	6.90	

against the literacy status of about 36 per cent in the country <sup>1/</sup>. Interestingly, the average literacy status of non-member households in Anand Pattern was as low as about 37 per cent. It was also observed that the proportion of illiteracy was found to be relatively higher in the marginal farmers and landless labour categories of households as compared to that of others. In terms of education attainment level, interestingly, medium and large farmers of member and non-member groups were relatively more enlightened in both the patterns.

#### 5.1.3 Caste Structure:

The social stratification of sample households in terms of caste is essential for the identification of social status of the households. Therefore, distribution of households according to castes viz., Scheduled castes (SC), Backward classes (BC) and other castes (OC) was computed and is shown in Table 3.

The examination of Table 3 reveals that the overall average number of members belonging to Scheduled castes and Backward classes was only about 34 and 11 per cent respectively in the member group while the remaining 55 per cent of the members belonged to other castes. This indicated that the other caste people dominated in the dairy co-operatives. On the other hand, in the non-member group, the households of

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<sup>1/</sup> Anonymous, Employment News, October 24, 1981.

Table 3: Caste-wise Distribution of Sample Households.

Category of households	Members			( in percentage ) Non-members		
	Scheduled castes	Backward classes	Other castes	Scheduled castes	Backward classes	Other castes
<u>Anand Pattern</u>						
Landless labour	55.55	22.22	22.23	71.43	21.42	7.15
Marginal	33.33	6.67	60.00	57.14	28.57	14.49
Small	-	16.66	83.34	33.33	33.33	33.34
Medium	16.66	-	23.34	100.00	-	-
Large	16.66	-	83.34	66.66	-	33.34
Overall	36.66	13.34	50.00	66.66	20.00	13.34
<u>U.P. Pattern</u>						
Landless labour	22.22	27.78	50.00	77.77	-	22.23
Marginal	41.66	-	58.34	50.00	16.67	33.33
Small	55.55	-	45.45	20.00	-	80.00
Medium	33.33	-	66.67	28.57	14.29	57.14
Large	-	-	100.00	-	-	100.00
Overall	31.66	8.34	60.00	43.33	6.67	50.00
<u>Overall</u>						
Landless labour	42.22	24.44	33.34	73.91	13.04	13.05
Marginal	37.03	3.71	59.26	53.85	23.07	23.08
Small	33.33	6.77	60.00	25.00	12.50	62.50
Medium	23.57	-	71.43	50.00	10.00	40.00
Large	8.33	-	91.67	33.33	-	66.67
Overall	34.16	10.84	55.00	55.00	13.33	31.67

scheduled castes indicated the majority. It was observed that proportion of scheduled castes decreased with an increase in the farm size as is reflected from the overall picture of the member group.

#### 5.1.4 Size of Land Holdings:

Land is the main resource base of the farmers in the production process. The economic and social progress of the households largely depends on the size of operational holdings. The land resources such as soil, water, natural vegetation, minerals etc. are transferred into economic goods and services with the help of labour and capital inputs. Since these resources are relatively more scarce, optimum return from land, therefore, largely depends on how best farmers make use of it. Keeping in view the significance of land resources, the average size of owned and operational holding along with operated and irrigated area on different categories of farms were worked out and are presented in Table 4.

The close perusal of Table-4 reveals that the overall average size of owned and operational holding was almost the same on member and non-member households. It was observed that practice of leasing-in land was prevalent only on the households of U.P. Pattern. Further, it is interesting to note

Table 4: Size of Land holdings, Operated and Irrigated Area.

Category of households	(Area in hectares)					
	Members			Non-members		
	Owned holding	Operational holding	Area under irrigation (in %)	Owned holding	Operational holding	Area under irrigation (in %)
<u>Anand Pattern</u>						
Marginal	0.49	0.49	100.00	0.58	0.58	100.00
Small	1.51	1.51	100.00	1.70	1.70	100.00
Medium	2.60	2.60	94.35	2.53	2.53	76.84
Large	5.61	5.61	88.12	4.56	4.56	83.04
Overall	1.99	1.99	92.57	1.90	1.90	86.61
<u>U.P. Pattern</u>						
Marginal	0.53	1.00	82.00	0.59	0.49	100.00
Small	1.47	1.65	100.00	1.54	1.54	100.00
Medium	2.47	2.89	95.00	2.67	2.67	98.29
Large	5.23	5.23	100.00	5.20	5.73	100.00
Overall	2.10	2.42	96.70	2.11	2.22	99.31
<u>Overall</u>						
Marginal	0.50	0.66	95.45	0.49	0.53	100.00
Small	1.49	1.59	100.00	1.60	1.60	100.00
Medium	2.61	2.80	90.23	2.63	2.83	92.09
Large	5.42	5.42	93.84	4.88	5.15	92.48
Overall	2.08	2.21	95.08	2.03	2.08	94.30

that overall average area under irrigation was about 95 and 94 per cent on member and non-member households respectively. Such a situation is quite conducive for taking up intensive crop rotations and adoption of new technology of crop production.

#### 5.1.5 Distribution of Milch Animals:

The number of milch animals of different species on the household indicates the economic status of the owner. Therefore, milch animals of different types viz., buffalo, crossbred cow, and local cow maintained on different categories of households were worked out and are given in Table 5.

A close look at Table-5 indicates that the overall average number of milch animals per household was about 2 milch animals on both member and non-member households. It was also noted that number of milch animals had no relationship with farm size. It is interesting to observe that the number of crossbred and local cows was relatively higher on member households as compared to that of non-member households. Further, the non-member households of U.P. pattern did not possess any crossbred cow while non-member households of Anand Pattern had no local cow. It was observed that the number of buffaloes was more than cows on member and non-member households. In view of the fact that the study area

Table 5: Distribution of Milch Animals on Sample Households

(No. of Animals/household) ✓

Category of households	Members				Non-members			
	Buffaloes	Cross- bred cows	Local cows	Total	Buffaloes	Cross- bred cows	Local cows	Total
1	2	3	4	5	6	7	8	9
Anand Pattern								
Landless labour	1.89 (87.93)	0.04 ( 1.72)	0.22 (10.35)	2.15 (100.0)	1.29 (94.73)	0.07 ( 5.27)	-	1.36 (100.00)
Marginal	2.00 (81.08)	0.20 ( 8.10)	0.27 (10.87)	2.47 (100.00)	1.30 (100.0)	-	-	1.30 (100.00)
Small	2.83 (77.27)	-	0.83 (22.73)	3.66 (100.0)	2.67 (100.0)	-	-	2.67 (100.00)
Medium	1.66 (100.0)	-	-	1.66 (100.0)	1.67 (100.0)	-	-	1.67 (100.0)
Large	2.50 (93.75)	0.16 ( 6.25)	-	2.66 (100.0)	2.67 (100.0)	-	-	2.67 (100.00)
Overall	2.85 (86.01)	0.08 ( 3.49)	0.25 (10.48)	2.38 (100.0)	1.60 (97.95)	0.03 ( 2.05)	-	1.63 (100.00)

(Table....continued)

(Table 5 continued)

	1	2	3	4	5	6	7	8	9
					<u>U.P. Pattern</u>				
Landless labour	1.78 (100.00)	-	-	1.78 (100.00)	1.44 (100.00)	-	-	-	1.44 (100.00)
Marginal	1.33 (100.00)	-	-	1.33 (100.00)	1.50 (100.00)	-	-	-	1.50 (100.00)
Small	1.56 (100.00)	-	-	1.56 (100.00)	2.00 (100.00)	-	-	-	2.00 (100.00)
Medium	2.13 (82.22)	0.20 ( 7.89)	0.20 (7.89)	2.53 (100.00)	1.90 (86.66)	-	0.29 (13.34)	-	2.19 (100.00)
Large	2.67 (94.12)	0.16 ( 5.88)	-	2.83 (100.00)	3.67 (91.66)	-	0.33 (8.34)	-	4.00 (100.00)
Overall	1.83 (94.01)	0.07 ( 3.41)	0.05 ( 2.58)	1.95 (100.00)	1.87 (94.91)	-	0.10 ( 5.09)	-	1.97 (100.00)
				<u>Overall</u>					
Landless labour	1.84 (92.22)	0.02 ( 1.11)	0.14 (6.67)	2.00 (100.0)	0.97 (96.87)	0.03 (3.13)	-	-	1.00 (100.00)
Marginal	1.70 (86.79)	0.11 ( 5.66)	0.15 ( 7.55)	1.90 (100.0)	1.40 (100.00)	-	-	-	1.40 (100.00)
Small	2.07 (80.11)	-	0.33 (13.89)	2.40 (100.0)	2.25 (100.00)	-	-	-	2.25 (100.00)
Medium	2.00 (87.50)	0.14 ( 6.25)	0.14 ( 6.25)	2.28 (100.0)	1.80 ( 90.00)	-	0.20 (10.00)	-	2.00 (100.00)
Large	2.58 (93.93)	0.17 ( 6.07)	-	2.75 (100.0)	3.17 ( 95.00)	-	0.17 ( 5.00)	-	3.34 (100.00)
Overall	1.94 (83.99)	0.08 ( 3.66)	0.16 ( 7.35)	2.18 (100.0)	1.73 ( 96.67)	0.02 ( 0.92)	0.05 ( 2.46)	-	1.80 (100.00)

Figures in parentheses indicate percentage to total.

is dominated by buffaloes, intensive efforts should be made to upgrade the non-descript buffaloes for increased milk production.

## 5.2 Organizational Structure of Co-operatives:

The organizational structure of co-operatives is uniform in almost all the fields of the co-operative movement. This structural uniformity owes its origin to the fact that all co-operative societies are bounded on the same basic principles. Though the rules of various forms of co-operative societies may vary according to their functions but their principles are basically the same.

The organization can no longer remain static. The required changes are made with respect to its basic objectives, size and pattern of staff, their professional competence, programme emphasis, the nature of institutional relationships due to changed circumstances with in which an organization operates. Similarly, the need for long run as well as short run planning of programmes, personnel and finances may require many adjustments in the form of the administrative and organizational structure. In short, the organizational structure should be subject to continuous adaptations as conditions warrant.

### 5.2.1 Organizational Problems:

A wide range of factors contribute to the efficiency of an organization in a particular situation. The following

factors were found to be of special attention for organizing the dairy co-operatives at village level and building up of an efficient organization.

Size of Society - Organization of dairy co-operatives as a viable unit is very essential for the success of co-operative movement. A minimum limit of 30 members for the registration of a society seems to be unrealistic for the milk procurement of about 250 litres per day. It was observed that the average number of membership in three types of milk co-operatives selected for the present study viz., efficient, less efficient and non-efficient in Anand Pattern was only 40. However, in case of U.P. Pattern, the average membership of three selected societies was about 151. It is interesting to note that about 68 and 21 per cent of the total members of Anand and U.P. Pattern respectively supplied milk during the year 1981-82. It was further observed that the average quantity of milk procurement per day in Anand Pattern and U.P. Pattern was about 106 and 74 litres respectively. The above figures point out the fact that due to less number of members in the society of Anand Pattern, the milk procurement was not upto the required level. Further, despite the relatively large membership in the societies of U.P. Pattern, the milk procurement was much less as compared to that of Anand Pattern. This was evident from the fact that only about one fifth of the members supplied milk to

the society during the year, while remaining members seem to have sold their marketable surplus to the private milk vendors operating in the villages.

It is, therefore, suggested that a minimum limit of 30 members should be raised to at least 50 so as to achieve the desired level of procurement. Further, it should be made compulsory for the members to supply milk to the society only. In case a member does not comply with the rules, his membership should be cancelled and he should be debarred from becoming member of any co-operative society in future.

Size of Staff and Infra-structure: - The organization is expected to expand and therefore, there should be enough scope for its expansion in both the patterns. It was observed through the investigation that about 28 and 56 per cent of the sample households of Anand and U.P. patterns respectively felt that there should be an increase in the size of staff at different levels. For instance, a Secretary of the society in Anand and U.P. patterns does various jobs like collection of milk, testing of fat and solid-not-fat (SNF), estimation of amount to be paid to the member suppliers of milk and its weekly payment, keeping the accounts and preparation of balance-sheet and submission of reports. In Anand pattern, the Secretary, in addition to above jobs, also supplies fodder seeds and subsidised feed to the members of the society while such

facilities are not available to the members of U.P. pattern societies. It was observed that facilities for artificial insemination, treatment, vaccination etc. were conspicuous by their absence in U.P. pattern societies while these were grossly inadequate in Anand pattern. Therefore, a trained/experienced stockman should be selected and deputed at the society level to provide such facilities especially to the members in an integrated manner.

It was revealed by the members that there was an urgent need for suitable working space where milk procurement, testing, keeping of testing equipment etc. could be properly done. The hired room or any building in the village was reported to be inadequate to serve the purpose. Therefore, provision should be made to construct a permanent and suitable building for the purpose on the suitable land provided by the village panchayat.

There were certain societies which have been organized in the interior rural side. These villages were not connected with metalled roads. Therefore, priority for construction roads should be given to such villages so as to facilitate smooth transport of milk and its marketing. With the increase in staff and other facilities, a higher degree of specialization will occur. This calls for more co-ordination among members of the society and other staff at the district level.

Vested Interest: - In the interest of co-operative movement, it has become necessary that some means are devised, either by convention or by law, for ensuring that the milk co-operatives as other co-operatives are not monopolized by a few for their own advantage. A number of measures may be adopted for curbing the growth of vested interest in the societies such as:

- Exclusion of money lenders, big landlords, traders and other middlemen from the membership of the co-operatives.
- Reservation of seats in the Board of Management to small farmers/milk producers.
- Restriction of holding office for more than two terms in the same institution and also holding office simultaneously in more than two institutions.
- Meeting of the general body to be held regularly to consider the accounts and holding elections to the Committee of Management.
- Arrangements for audit and concurrent audit provision in all the activities of a society.

Co-operative Education: - For the co-operative movement to be self-reliant and develop on sound and healthy lines, emphasis should be laid on the co-operative education to the members of the societies. It was observed that majority of the members of the societies in U.P. pattern expressed their desire for training on dairy farming and co-operative principles and practices so that they could increase their milk production and supply adequate quantity of milk to the society and learn the essentials of co-operatives.

### 5.2.2 Operational Problem:

One of the most important factors for the poor, the performance of milk co-operatives is that they have not realized the crucial importance of increasing yield per animal by better breeding and feeding. A major area of weakness of primary dairy co-operatives is that they function merely as the milk venders' purchasing milk from their members and selling it to dairy plants in co-operative and/or public sector. Dairy development is an integrated process. Therefore, unless dairy co-operatives adopt an integrated approach, success will always elude them. The objectives of dairy co-operatives is not the maximization of profit but the maximization of satisfaction and services to the members.

Dairy co-operative should not forget that the loyalty of members is to be ensured through efficient service. The most significant of the services is economic profit to the members through remunerative price and regularity in payment of their milk. It has been observed that it is the favourable pricing policy adopted by the milk co-operatives in Maharashtra that has been largely responsible for large-scale development of dairy co-operatives in Maharashtra.

It was further observed that about 38 per cent of the members of the societies in both the patterns were not satisfied with the milk price offered by the dairy co-operatives. Therefore, it was suggested that milk price in both the patterns

should be increased so as to make dairying a profitable position. In view of the credit requirement for the purchase of milch animal and family consumption or to meet social obligations, nearly 51 per cent of the total member households expressed the need to make a provision for getting advances against their expected milk supplies.

It was noted that about 55 per cent of the members of the societies of both the patterns felt the problem of testing of fat and SNF and measurement of their milk. Therefore, provision should be made to provide additional staff assistance to the secretary. Besides, regular checking and supervision of testing of milk should also be done so that there is no bias in testing and measurement.

In view of the above discussed organizational and operational problems, there is an urgent need for making improvements and providing required facilities to the members of the societies of both the patterns. The success of the co-operatives and their efficiency are directly related to the problems encountered by the members which need urgent attention of the planner and administrators.

### 5.3 Resource Utilization:

The level of output and income on the farm depends upon the entities of various factors of production used in the

production process. In order to study the pattern of use of major factors of production such as land, labour and capital, the data pertaining to cropping pattern, productivity of milch animals, human labour use in dairy and capital investment in dairy enterprise have been analysed and discussed in this section.

#### 5.3.1 Land Use Pattern:

The returns on the farm largely depend upon the land use pattern. The selection of various enterprises, their combination and level on the farm directly affect the farm income. Therefore, it is essential to study the land use through the pattern of cropping followed by the sample households along with intensity of cropping. Keeping this end in view, the area under broad categories of crops viz., cereals, pulses, fodders, cash crops, oil seeds, were worked out for members and non-members households of Anand and U.P. Patterns and are presented in Table 6.

The examination of Table 6 reveals that the overall average area under cereal crops was the highest (73 per cent) followed by pulse crops (16 per cent) in member households as against 71 and 8 per cent of the total cropped area on non-member households. It was observed that the marginal farmers of non-members group grew only cereal and fodder crops. Further, the intensity of cropping showed a decreasing trend with farm size.

The overall cropping intensity was worked out to be

Table 6: Cropping Pattern and Intensity on Sample Farms.

(in hectare)										
Crops	Members					Non-members				
	Marginal	Small	Medium	Large	Overall	Marginal	Small	Medium	Large	Overall
	2	3	4	5	6	7	8	9	10	11
<u>Anand Pattern</u>										
Cereals	8.36 (64.90)	8.80 (64.77)	22.00 (83.75)	27.84 (60.00)	67.00 (67.59)	7.12 (87.25)	4.92 (61.19)	7.60 (62.93)	14.32 (68.08)	33.96 (68.86)
Pulses	0.16 ( 1.24)	-	2.16 (8.33)	2.80 (6.03)	5.12 ( 5.17)	-	0.28 (3.48)	1.36 (11.25)	1.20 (5.70)	2.84 (5.76)
Fodders	2.76 (21.42)	2.40 (17.64)	1.84 ( 7.01)	6.64 (14.31)	13.64 (13.76)	1.04 (12.75)	1.20 (14.94)	1.20 ( 9.93)	2.48 (11.78)	5.92 (12.00)
Cash crops	1.60 (12.44)	2.40 (17.64)	0.24 ( 0.91)	9.12 (19.66)	13.36 (13.48)	-	1.64 (20.39)	1.92 (15.89)	3.04 (14.78)	6.60 (13.38)
Oil seeds	-	-	-	-	-	-	-	-	-	-
Total cropped area	12.88 (100.00)	13.60 (100.00)	26.24 (100.00)	46.40 (100.0)	99.12 (100.0)	8.16 (100.0)	8.04 (100.00)	12.08 (100.00)	21.04 (100.00)	49.32 (100.00)
Cropping Intensity	175.00	150.00	160.00	138.00	151.00	200.00	158.00	159.00	154.00	162.00

(Table ..... continued)

[Table 6 continued]

1	2	3	4	5	6	7	8	9	10	11
	<u>U.P. Pattern</u>									
Cereals	15.60 (90.48)	20.84 (84.99)	39.92 (76.12)	24.23 (69.26)	100.68 (77.85)	5.88 (97.35)	10.96 (83.03)	21.28 (75.57)	14.72 (57.16)	52.84 (72.24)
Pulses	0.44 ( 2.55)	1.48 (6.03)	4.56 (8.69)	2.88 (8.20)	9.36 (7.24)	-	0.64 (4.84)	2.16 (7.67)	4.00 (15.52)	6.80 ( 9.29)
Fodders	0.48 (2.78)	1.64 ( 6.69)	2.00 (3.84)	2.40 (6.83)	6.52 (5.04)	0.16 (2.65)	0.72 (5.45)	1.44 (5.11)	3.44 (13.35)	5.76 (7.87)
Cash crops	0.44 ( 2.55)	0.56 (2.29)	3.24 (6.17)	3.28 (9.35)	7.52 (5.82)	-	0.88 (6.68)	2.40 (8.53)	3.20 (12.42)	6.48 (8.85)
Oil seeds	0.28 (1.64)	-	2.72 ( 5.12)	2.24 (6.38)	5.24 (4.05)	-	-	0.88 (3.32)	0.40 (1.55)	1.28 (1.75)
Total cropped area	17.24 (100.00)	24.52 (100.00)	52.44 (100.0)	35.12 (100.0)	129.32 (100.00)	6.04 (100.00)	13.20 (100.0)	28.16 (100.0)	25.76 (100.0)	73.16 (100.00)
Cropping Intensity	143.66	165.00	121.00	112.0	127.00	205.00	172.00	150.00	150.00	157.00

(Table ..... continued)

(Table 6 continued)

1	2	3	4	5	6	7	8	9	10	11
<u>Overall</u>										
Cereals	23.96 (79.54)	29.64 (77.25)	61.92 (78.70)	52.16 (63.98)	167.68 (73.40)	13.00 (91.54)	15.88 (74.76)	28.88 (71.77)	29.04 (62.05)	86.80 (70.87)
Pulses	0.60 (1.99)	1.48 (3.88)	6.72 (8.54)	5.68 (6.97)	14.48 (16.33)	-	0.92 (4.35)	3.52 (8.75)	5.20 (11.12)	9.64 (7.87)
Fodders	3.24 (10.75)	4.04 (10.59)	3.84 (4.88)	9.04 (11.08)	20.16 (8.84)	1.20 (8.46)	1.92 (9.03)	2.64 (6.56)	5.92 (12.65)	11.68 (9.55)
Cash crops	2.04 (6.77)	2.96 (7.78)	3.48 (4.42)	12.40 (15.22)	20.88 (9.14)	-	2.52 (11.86)	4.22 (10.73)	6.24 (13.33)	13.08 (10.67)
Oil seeds	0.28 (0.95)	-	2.72 (3.46)	2.24 (2.75)	5.24 (2.29)	-	-	0.88 (2.19)	0.40 (0.85)	1.28 (1.04)
Total cropped area	30.12 (100.00)	38.12 (100.00)	78.68 (100.00)	81.52 (100.00)	228.44 (100.0)	14.20 (100.00)	21.24 (100.0)	40.24 (100.0)	46.80 (100.0)	122.48 (100.00)
Cropping Intensity	169.00	159.00	134.00	125.00	136.00	203.00	166.00	153.00	152.00	159.00

Figures in parentheses indicate percentage to total.

136 and 159 per cent on member and non-member households respectively. It may be seen from the table that the member households of Anand pattern allocated about 68 and 14 per cent of the total cropped area to cereal and fodder crops respectively as against 69 and 12 per cent of the total cropped area on non-member households. But in case of U.P. pattern, the average area under cereal and fodder crops was only about 78 and 7 per cent on member households and 72 and 8 per cent of the total cropped area on non-member households respectively. It is interesting to note that marginal and small farms belonging to member and non-member households in Anand pattern respectively recorded about 21 and 5 per cent area under fodder crops. This only goes to show the importance attached to dairy enterprise by the households of the member group in Anand pattern. It was observed that oil seed crops were not the popular crops in the study area and no area was allocated to oil seeds by both the member and non-member households of Anand pattern. The table further revealed that the average cropping intensity on the farms of non-member households was relatively higher than that of member households both in Anand and U.P. patterns.

#### 5.3.2. Human Labour Utilization:

Human labour utilization in dairy enterprise on the households reflects the extent of employment available to the

family labour which largely depends on the size of dairy herd. Therefore, in order to study the labour utilization in dairy enterprise on different categories of households in both the patterns, data on the utilization of men, women and children per household in dairy enterprise was worked out and are given in Table-7.

It may be seen from Table-7 that the overall family labour utilization was higher on member households (440 man days) as compared to that of non-member households (365 man days). It was observed that the men, women and children accounted for about 29, 22 and 49 per cent of the total labour use in dairy enterprise respectively on the member household as against 30, 25 and 47 per cent on non-member households. The average number of man days of men, women and children on member households in Anand pattern was higher as compared to that of non-member households. This indicated that the members of the society were more conscious of their milch animals and they devoted more time to dairy enterprise as compared to non-member households in Anand Pattern while reverse was true for U.P. pattern. It was further observed that the total labour use in dairy enterprise was more on the households of Anand pattern as compared to that of U.P. pattern.

### 5.3.3 Capital Investment in Dairy Enterprises

The pattern and magnitude of investment in fixed assets of dairy enterprise are important indicators of the income

Table 7: Family Labour Utilization in Dairy Enterprise.

Category of households	Member				(Man day's/household) Non-member			
	Men	Women	Children	Total	Men	Women	Children	Total
	<u>Anand Pattern</u>							
Landless	108.81	72.72	217.13	398.66	80.86	76.37	152.73	309.46
Marginal	105.51	111.72	248.26	465.49	111.52	83.64	120.82	315.98
Small	157.44	121.11	230.11	508.66	110.06	82.55	165.09	357.70
Medium	146.42	125.50	271.93	543.85	101.68	169.46	203.36	474.50
Large	366.33	160.27	228.95	755.55	213.48	160.11	426.97	800.56
Overall	138.32	100.85	243.48	482.65	107.85	97.33	176.24	381.42
Percentage to total.	33.10	22.13	44.77	100.00	27.34	25.33	47.33	100.00
	<u>U.P. Pattern</u>							
Landless	67.88	74.35	187.48	329.71	111.89	69.95	132.87	314.71
Marginal	86.54	91.09	191.32	368.95	104.02	69.35	161.82	335.19
Small	108.31	66.65	208.29	383.25	79.28	56.63	215.22	351.13
Medium	124.29	96.66	225.56	446.51	93.73	112.47	168.70	374.90
Large	139.91	139.91	279.84	559.66	179.99	80.00	160.00	419.99
Overall	97.87	89.45	210.46	397.78	107.37	116.83	328.38	349.45
Percentage to total.	25.24	22.44	52.32	100.00	31.60	21.62	46.70	100.00
	<u>Overall</u>							
Landless	91.05	72.83	200.30	364.18	93.62	74.90	143.56	312.08
Marginal	95.96	100.13	221.13	417.22	107.44	78.14	140.00	325.58
Small	133.79	89.19	222.98	445.95	88.60	63.79	202.02	354.41
Medium	138.65	100.94	247.59	495.18	101.93	131.66	191.12	424.70
Large	223.58	157.82	276.20	657.60	219.70	115.95	274.62	610.27
Overall	118.86	96.85	224.50	440.21	109.63	87.70	168.10	365.43
Percentage to total.	28.70	22.22	49.08	100.00	30.16	22.91	46.93	100.00

generating capacity of the households. Therefore, investment in dairy farm assets made on different categories of households of member and non-member groups was analysed. The broad categories of dairy investment considered here were (i) cattle-shed, (ii) store for fodder, (iii) dairy equipments and (iv) milch animals which was worked out for member and non-member households of Anand and U.P. patterns separately and are shown in Table 8.

Examination of Table-8 revealed that there was wide variation in the total investment in dairy assets per household made on member and non-member households. The overall average per household investment was higher on member households (Rs. 14225 ) as compared to that of non-members households (Rs. 10868 ). It was observed that the overall investment in cattle-shed was the highest on member and non-member households accounting for about 45 and 40 per cent of the total investment in dairy enterprise respectively. While about 38 and 40 per cent of the investment was made in milch animals on member and non-member household respectively. It was also observed that the average investment in dairy enterprise on member and non-member households of Anand pattern was higher than their counterparts in U.P. pattern.

Table-9 shows the investment per milch animal on fixed assets of dairy enterprise on member and non-member households in both the patterns.

**Table 8: Per Household Investment in Dairy Assets.**

Particulars	(in Rupees)					
	Anand Pattern		U.P. Pattern		Overall	
	Member	Non-member	Member	Non-member	Member	Non-member
Cattleshed	6057.60 (39.26)	4920.00 (40.71)	6675.00 (51.26)	3730.00 (38.63)	6366.25 (44.75)	4325.00 (39.79)
Store for Fodder	506.66 (3.28)	255.00 (2.11)	542.00 (4.16)	278.33 (2.88)	524.33 (3.68)	266.66 (2.45)
Dairy Equipments	2397.73 (15.54)	2206.53 (18.26)	1450.90 (11.14)	1756.40 (18.19)	1924.32 (13.52)	1981.46 (18.23)
Milch Animals	6467.33 (41.92)	4701.66 (38.92)	4353.16 (33.44)	3888.66 (40.30)	5410.25 (38.05)	4295.16 (39.53)
Total	15429.23 (100.00)	12083.20 (100.00)	13021.06 (100.00)	9653.40 (100.0)	14225.15 (100.00)	10868.30 (100.00)

Figures in parentheses indicate percentage to total.

Table 9: Investment in Dairy Assets Per Milch Animal.

Particulars	Anand Pattern		U.P. Gattarn		Overall	
	Member	Non-member	Member	Non-member	Member	Non-member
Cattle shed	2541.60 ( 39.46)	3012.24 (40.71)	3423.07 (51.26)	1896.61 (38.63)	2938.26 (44.75)	2402.77 (39.79)
Store for Fodder	212.58 ( 3.28)	156.12 (2.11)	277.94 (4.16)	141.52 (2.83)	242.00 (2.68)	148.14 ( 2.45)
Dairy Equipment	1006.04 (15.54)	1350.93 (18.26)	744.05 (11.14)	893.08 (18.19)	888.14 (13.52)	1100.00 (18.23)
Milch Animals	2713.56 (41.92)	2878.37 (38.92)	2232.39 (33.44)	1977.28 (40.30)	2497.03 ( 38.05)	2386.20 (39.53)
Total	6473.80 (100.00)	7397.87 (100.00)	6677.47 (100.00)	4908.50 (100.00)	8565.45 ( 100.00)	6037.94 (100.00)

Figures in parentheses indicate percentage to total.

A close perusal of Table-9 indicated that the overall average investment per milch animal on different assets of dairy enterprise was Rs. 6565 on member households as against Rs. 6038 on non-member households. It was observed that member households relatively invested more in cattle-shed and milch animals as compared to non-member households. It was further observed from the table that the overall average investment per milch animal was higher on member households as compared to that of non-member households in Anand pattern. This indicated that the member households had relatively larger herd size as compared to that of non-member households of this pattern.

#### 5.3.4 Productivity Per Animal:

Milk yield is a function of many factors such as breeding, feeding and management of milch animals. The average milk yield of lactating and milch animals was, therefore, estimated for member and non-member households of Anand and U.P. patterns separately and are presented in Table 10. Whereas daily milk yield per lactating and milch animal in different seasons is given in Appendix XX.

It is interesting to note from Table-10 that the overall average milk yield per lactating animal was higher on member households as compared to that of non-member households. This

Table 10: Average Milk Yield Per Lactating and Milch Animal.

Category of households	(Yield/day in litres)											
	Anand Pattern				U.P. Pattern				Overall			
	Member		Non-member		Member		Non-member		Member		Non-member	
	Lactating animal	Milch animal	Lactating animal	Milch animal	Lactating animal	Milch animal	Lactating animal	Milch animal	Lactating animal	Milch animal	Lactating animal	Milch animal
Landless labour	5.19	3.14	4.27	2.84	4.84	2.76	5.07	4.46	5.01	3.01	4.67	3.50
Marginal	5.18	2.75	4.68	2.87	4.65	3.06	4.69	3.01	4.91	2.85	4.68	3.49
Small	6.53	3.10	4.84	2.76	4.89	3.96	5.80	4.02	5.71	3.43	5.32	3.46
Medium	5.51	4.90	5.12	4.35	4.99	2.61	4.92	3.34	5.25	3.09	5.02	3.59
Large	5.91	4.32	6.66	5.39	5.04	2.57	5.18	2.87	5.47	3.93	4.92	3.87
Overall	5.52	3.31	4.79	3.67	4.87	2.98	5.05	3.56	5.19	3.16	4.92	3.61

indicated that the management and feeding inputs on member households was relatively superior as compared to that of non-member households. However, the overall average yield per milch animal was lower on member households as compared to that of non-member households. This could be attributed to longer dry period of milch animals owned by member households. It was noted that the average milk yield of milch animals on non-member households was higher than that of member households in U.P. pattern also indicating thereby the existence of better quality animals by non-members along with their better feeding and care.

#### 5.4.1 Milk Production:

The milk production in the household is expected to increase due to the increase in number of milch animals, better herd management and adequate provision of balanced feeds and fodders. The members of the society get various facilities which are likely to have positive impact on milk production. Therefore, in order to examine the impact of dairy co-operatives on milk production, data were analysed and are brought out in Table 11.

It may be observed from Table-11 that overall average milk production was although slightly higher for the member households than that of the non-member households, however, the

Table 11: Daily Milk Production on Different Categories of Households.

Category of household	(In litres/household)					
	Anand Pattern		U.P. Pattern		Overall	
	Member	Non-member	Member	Non-member	Member	Non-member
Landless labour	6.75*	3.84	4.90	6.45	5.82	5.15
Marginal	6.79 <sup>oo</sup>	5.11	4.07	4.52	5.43	4.84
Small	11.37	7.36	5.74	8.04	8.55	7.78
Medium	8.07	7.25	6.60	7.15	7.33	7.21
Large	11.52	14.36	10.11	11.47	10.82	12.91
Overall	7.88 <sup>oo</sup>	5.99	5.81	6.99	6.85	6.49

\* Significant at 10 percent level.

<sup>oo</sup> Significant at 5 percent level.

<sup>ooo</sup> Significant at 1 percent level.

\* Comparison within pattern between member and non-member households.

<sup>oo</sup> Comparison between member households of both the patterns.

difference was not found statistically significant when 't' test <sup>2/</sup> was applied to it. Thus, it leads one to infer that that dairy co-operatives, by and large, did not have any positive impact on milk production on the member households as reflected by the overall figures. It was further observed that the average milk production per household was the highest on large farms followed by small farms both on member and non-member households. It is interesting to observe that the average milk production on member households was significantly higher in Anand pattern than that of member households of U.P. pattern. It was further noted that milk production of landless labour of member group in Anand pattern was significantly higher than that of non-member landless labour households. This could be attributed to various facilities like provision of subsidised feed and fodder seeds to the members of Anand pattern which favourably affected the milk production on the households.

#### 5.4.2 Milk Consumption:

Consumption of milk is expected to increase due to increase in milk production and income on the households. Therefore, with a view to examining the impact of dairy co-operatives on milk consumption on the households, data were

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<sup>2/</sup> 't' test could not be applied in case of small, medium and large farm households in both the patterns due to small number of observations.

analysed to work out average consumption on different categories of member and non-member households of both the patterns and are brought out in Table-12. The quantity of milk consumption in the households was worked out by subtracting the quantity of milk sold from the total quantity of milk produced on the respective households.

It may be observed from Table-12 that overall average per household consumption was almost the same on member (2.19 litres) and non-member households (2.06 litres). Thus, it may be concluded that dairy co-operatives, by and large, did not show positive impact on milk consumption of the member households. The table further revealed that the level of milk consumption was not associated with farm size in both the patterns as well as in the overall situation. However, Sharma and Singh found the positive impact on milk consumption in the extension area of Intensive Cattle Development Project in Karnal District<sup>3/</sup>.

It was observed that the average milk consumption on member households of Anand pattern was higher than that of non-member households of U.P. pattern. However, in U.P. pattern, the average milk consumption was lower on member households as compared to that of non-member households.

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<sup>3/</sup> Sharma, P.K. and Singh, C.B. (1986) "Milk Production Consumption and Marketed Surplus in Rural Area", Dairy Guide, Vol. 8, No.8 ,pp:22-25.

Table 12: Average Milk Consumption on Different Categories of Households.

Category of households	(Litres/day)					
	Anand Pattern		U.P. Pattern		Overall	
	Member	Non-member	Member	Non-member	Member	Non-member
Landless Labour	2.20	1.02	1.16	1.07	1.68	1.05
Marginal	2.22	2.18	0.84	2.24	1.53	2.21
Small	3.17	1.03	1.70	2.75	2.43	2.10
Medium	1.08	1.11	2.64	2.27	1.85	1.73
Large	3.84	2.03	4.78	8.30	4.32	5.16
Overall	2.46	1.54	1.91	2.50	2.19	2.06

This could be attributed to higher level of milk production on non-member households as compared to that of member households. This indicated that dairy- co-operatives organized on Anand pattern only, had positive impact on milk consumption.

#### 5.4.5 Per Capita availability and Consumption of milk:

Per capita per day availability and consumption of milk on different categories of member and non-member households of both the patterns were also estimated and are presented in Table 13.

The perusal of Table-13 reveals that the overall average per capita availability and consumption of milk was 1153 gram and 368 gram on member households respectively as against 1225 gram and 328 gram on non-member households as compared to the per capita availability of 131 gram of milk in the country. This indicated that dairy co-operatives did not have any impact on these parameters.

It was further observed that the level of per capita availability of milk had close relationship with farm size on member and non-member households in Anand pattern. However, there was no such trend on the households of U.P. pattern.

Table 13: Per Capita Availability and Consumption of Milk on Different Categories of Households.

Category of households	(Milk in Gram/day)											
	Anand Pattern				U.P. Pattern				Overall			
	Member		Non-member		Member		Non-member		Member		Non-member	
	CA	CC	CA	CC	CA	CC	CA	CC	CA	CC	CA	CC
Landless labour	1148	374	781	207	866	205	1290	214	1003	289	1443	212
Marginal	1380	444	1054	449	603	125	932	464	941	265	1000	456
Small	1624	453	1472	206	1123	333	1297	444	1459	414	1353	365
Medium	1864	249	1556	293	1022	409	1252	398	1253	316	1335	320
Large	2095	698	2156	305	1167	552	1639	1186	1528	610	1890	755
Overall	1412	440	1468	503	922	303	1264	452	1153	368	1225	388

CA = Capita Availability; CC = Capita Consumption.

#### 5.4.4 Marketed Surplus of Milk:

Marketed surplus of milk largely depends on the milk production of the households. In order to assess the effect of dairy co-operatives on the marketed surplus of milk, data were analysed for member and non-member households of both the patterns and are brought out in Table-14.

The examination of Table-14 reveals that overall average marketed surplus of milk was almost the same on member (4.66 litres) and non-member households (4.4<sup>3</sup> litres), while the overall marketed surplus of milk to total production was 70 per cent on member as well as non-member households. Interestingly, the share of the weaker sections in the total marketed surplus was about 53 per cent on member households as against about 48 per cent on non-member households. However, in case of Anand pattern, the marketed surplus of milk to total production was higher on member households than that of non-member households. It was observed that the overall marketed surplus to total milk production ranged from about 60 per cent on large farms to 72 per cent on marginal farms of member group while it varied between 54 per cent on marginal farms and 80 per cent on landless labour households on non-members group. The table further revealed that the marketed surplus of milk to total milk production (67 per cent) was almost the same on member and non-member households in U.P. pattern while it

**Table 14: Marketed surplus of Milk on Different Categories of Households.**

Particulars	Category of Households							Overall
	Land- less	Margi- nal	Small	Medium	Large	Total		
1	2	3	4	5	6	7	8	
(Sale of milk in litres/day)								
<b>Anand Pattern</b>								
<u>Member</u>								
Sale of milk	4.55 (14.22)	4.57 (14.29)	8.20 (25.63)	6.99 (21.85)	7.68 (24.01)	31.99 (100.0)		5.42
Marketed surplus as percentage to production.	67.41	57.30	69.79	86.82	66.67	-		68.78
<u>Non-member</u>								
Sale of milk	2.82 (9.25)	2.93 (9.61)	6.33 (20.77)	6.07 (19.91)	12.33 (40.46)	30.48 (100.00)		4.45
Marketed surplus as percentage to production.	73.44	57.34	86.01	83.72	85.86	-		74.29
<b>U.P. Pattern</b>								
<u>Member</u>								
Sale of milk	3.74 (18.42)	3.23 (15.91)	4.04 (19.90)	3.96 (19.51)	5.35 (26.26)	20.30 (100.00)		3.90
Marketed surplus as percentage to production.	76.33	79.36	70.38	60.00	52.72	-		67.13
<u>Non-member</u>								
Sale of milk	5.38 (25.62)	2.28 (10.86)	5.29 (25.18)	4.88 (23.24)	3.17 (15.10)	21.00 (100.00)		4.40
Marketed surplus as percentage to production.	83.41	50.44	65.80	68.25	27.64	-		66.67

.....continued

(Table 14-----continued)

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
<u>Overall</u>								
<u>Member</u>								
Sale of milk	4.14 (15.86)	3.90 (14.94)	6.12 (23.44)	5.45 (20.87)	6.50 (24.89)	26.11 (100.0)		4.66
Marketed surplus as percentage to production.	71.13	71.02	71.57	74.76	60.07	-		70.17
<u>Non-member</u>								
Sale of milk	4.10 (15.99)	2.63 (10.26)	5.68 (22.15)	5.48 (21.37)	7.75 (30.23)	25.64 (100.00)		4.43
Marketed surplus as percentage to production.	79.61	54.33	73.00	76.00	60.03	-		70.07

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Figures in parentheses indicate percentage to total.

was 69 and 74 per cent on member and non-member households respectively in Anand pattern. Thus, it may be concluded that dairy co-operatives did not have positive influence on the marketed surplus of milk on member households as reflected by the overall figures.

#### 5.4.5 Marketed Surplus Functions:

It has been observed that in spite of the stringent feed and fodder resources, there has been a rise in milk production, consumption and sale in Uttar Pradesh. This acceleration, however, has failed to promote any systematic investigation into the factors affecting production and marketed surplus of milk. In order to formulate a realistic policy for dairy development in a particular region, the knowledge of the quantum of milk surplus, that can be extracted from the dairy sector, and various factors influencing it, is extremely important. Therefore, an attempt has been made to examine the relationship between the marketed surplus of milk and explanatory variables like level of milk production, family size, monthly disposable income, educational score of the households, price of milk and value of milch animal on the households of the study area. The marketed surplus functions of milk were estimated using linear, Cobb-douglas and Semi-log

functions <sup>4/</sup>. The functional analysis was run through different seasons for member and non-member households of both the patterns in the study area. Based on the signs and statistical significance of coefficients and coefficients of multiple determination, barring a few exceptions, Linear, Cobb-Douglas and Semi-log functions were selected on the basis of better fit criteria to portray the pace and pattern of variables in marketed surplus. The examination of zero-order correlation matrices revealed the absence of impending multi-collinearity problem. The season-wise exploration of the behaviour of explanatory variables has been provided with a fairly detailed treatise here.

#### 5.4.6 Marketed Surplus functions - Anand Pattern:

The results of the seasonal regression equations developed for member and non-member households of Anand pattern are presented in Table-15.

A close look at the table reveals that the explanatory variables of production of milk, monthly disposable income, family size, education score, price of milk during the season

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<sup>4/</sup> To examine the relationship of the marketed surplus of milk with explanatory variables, K.C. Tyagi et al. (1977), I.S. Narula (1975) and Kuber Ram (1973) fitted Cobb-Douglas type of equations only. However, both the linear and log-linear functional specifications were employed by R. Krishna (1965), K.L. Sharma and M.P. Gupta (1970) and other researchers for explaining the variations in marketed surplus of crop produce across the farms.

Table 15: Marketed Surplus Functions on Member and Non-member Households of Anand Pattern.

Group/ Season/ Equation	No. of obser- va- tions.	Intercept	Regression Coefficients of Independent Variables					R <sup>2</sup>	
			Milk Produc- tion. (X <sub>1</sub> )	Dispos- able Income (X <sub>2</sub> )	Family Size (X <sub>3</sub> )	Education Score (X <sub>4</sub> )	Price of Milk (X <sub>5</sub> )		Value of Milch Animal. (X <sub>6</sub> )
<u>Member</u>									
Rainy Linear	51	-3.3211	*** 0.7167 (0.0346)	** 0.0026 (0.0010)	0.0774 (0.1164)	-0.0235 (0.1883)	0.0103 (0.0004)	0.0001 (0.0003)	0.9372
Winter Linear	59	-1.5628	*** 0.6290 (0.0484)	** 0.0020 (0.0010)	-0.0660 (0.1133)	0.0917 (0.2068)	0.0100 (0.0118)	-0.0001 (0.0003)	0.8301
Summer Linear	49	-1.1033	*** 0.7514 (0.0353)	-0.0003 (0.0005)	-0.0606 (0.0693)	-0.2339 (0.1070)	0.0078 (0.0067)	0.0000 (0.0002)	0.9193
<u>Non-member</u>									
Rainy Cobb-Douglas	23	-3.8904	*** 0.9898 (0.0798)	* 0.0802 (0.0430)	0.0631 (0.1032)	-0.0149 (0.0153)	0.8741 (0.4380)	-0.2213 (0.1142)	0.9488
Winter Cobb-Douglas	23	-5.3155	*** 0.9688 (0.0882)	* 0.0835 (0.0409)	0.0358 (0.1231)	-0.0155 (0.0164)	1.2833 (0.5029)	0.3262 (0.1227)	0.9322
Summer Cobb-Douglas	20	0.2957	*** 0.9711 (0.1137)	** -0.1498 (0.0649)	-0.0530 (0.1278)	-0.0060 (0.0186)	-0.2872 (0.3818)	0.2626 (0.1719)	0.8574

\*\*\* significant at 1 per cent level  
 \*\* significant at 5 per cent level  
 \* significant at 10 per cent level

and average value per milch animal together explained about 85 to 94 per cent of variation in marketed surplus of milk in different seasons as indicated by the coefficient of multiple determination ( $R^2$ ). It was noted that the regression coefficients of milk production variable were positive and statistically significant at 1 per cent level of significance in all the seasonal equations. The regression coefficients of this variable varied in between 0.6290 in winter season on the member households and 0.9898 in rainy season on non-member households. This indicated that in case of former, one unit increase of milk production per day increased marketed surplus of milk by 0.62 litres. However, in case of later, one per cent increase in milk production per day increased marketed surplus of milk by about 0.99 per cent in rainy season. Milk production, therefore, appears to have the most powerful influence on marketed surplus of milk in all the seasons. Thus, it may be concluded that it is essential to increase milk production in the area for achieving higher level of marketed surplus. The regression coefficients of monthly disposable income were found to be positive and statistically significant in rainy and winter seasons on both the groups of households indicating thereby its positive impact on marketed surplus of milk. However, in the summer season on non-member group of households, the regression coefficient was negatively significant indicating thereby the negative impact of this variable on marketed surplus

of milk in the season, because generally the farmers have relatively more disposable income during summer season especially after the harvest of crop and they reduce the marketed surplus of milk in this season and divert it for family consumption. The regression coefficient of education score variable was found to be negative and statistically significant only in summer season on member households. This indicated that the education score variable had negative effect on marketed surplus of milk. In other words, with the increase in the level of education, there was a decrease in marketed surplus of milk in the season. The regression coefficients of price of milk variable were found to be positive and statistically significant in rainy and winter seasons on non-member households. This reflected that marketed surplus of milk increased with an increase in the price of milk.

#### 5.4.7 Marketed Surplus Functions - U.P. Pattern:

The results of the regression equations developed for rainy, winter and summer seasons for member and non-member households in U.P. pattern are given in Table-16.

It can be seen from the table that the variables of milk production, monthly disposable income, family size, price of milk, education score and average value of per milch animal together explained 76 and 96 per cent variation in milk production in different seasons as indicated by the coefficients

Table 16: Marketed Surplus Functions on Member and Non-member Households of U.P. Pattern.

Group/ Season/ Equation	No. of obser- vations	Intercept	Regression Coefficients of Independent Variables						R <sup>2</sup>
			Milk Produc- tion, (X <sub>1</sub> )	Dispos- able income (X <sub>2</sub> )	Family size (X <sub>3</sub> )	Education Score (X <sub>4</sub> )	Price of milk (X <sub>5</sub> )	Value of milch animal. (X <sub>6</sub> )	
<b>Member</b>									
Rainy Cobb-Douglas	50	-2.8485	*** 0.8343 (0.0789)	** 0.1011 (0.0435)	-0.0612 (0.0995)	** -0.0439 (0.0171)	0.1320 (0.2720)	0.2081 (0.1746)	0.7629
Winter Linear	57	0.0873	*** 0.6471 (0.0519)	0.0004 (0.0005)	-0.0126 (0.0814)	** -0.2435 (0.1000)	0.3770 (0.4168)	-0.0000 (0.0003)	0.8067
Summer Semilog	52	4.4491	*** 3.5756 (0.3280)	-0.0092 (0.1640)	0.4972 (0.4016)	-0.0606 (0.0624)	0.9155 (1.0789)	-0.0132 (0.6553)	0.7790
<b>Non-member</b>									
Rainy Linear	18	0.8460	*** 0.9234 (0.0848)	0.0013 (0.0023)	0.1171 (0.2644)	** -0.3816 (0.1482)	-0.3130 (1.2322)	-0.0083 (0.0010)	0.9344
Winter Cobb-Douglas	19	0.2029	*** 1.1000 (0.1048)	-0.0473 (0.0816)	-0.0160 (0.2080)	-0.0038 (0.0388)	0.0936 (0.5351)	-0.1048 (0.2423)	0.9450
Summer Cobb-Douglas	17	-0.8636	*** 0.9564 (0.0775)	-0.1251 (0.9887)	-0.0590 (0.1536)	0.0198 (0.0257)	0.1727 (0.5300)	0.0855 (0.2555)	0.9633

\*\*\* Significant at 1 per cent level.  
 \*\* Significant at 5 per cent level.  
 \* Significant at 10 percent level.

of multiple determination ( $R^2$ ). It is interesting to observe that the regression coefficients of milk production variable were positive and statistically significant in all the seasonal equations. This indicated that the per day milk output influenced the marketed surplus positively in all the seasons. The regression coefficient of monthly disposable income was positive and statistically significant only in rainy season on member households. This indicated that the increase in monthly income increased marketed surplus of milk. It was further observed that the regression coefficients of equation score were found to be negative and statistically significant in rainy and winter seasons on member households and only in rainy season on non-member households. This indicated that an increase in the level of education decreased the marketed surplus of milk on the households in the respective seasons.

#### 5.4.8 Overall Marketed Surplus Functions:

Data pertaining to member households of both the patterns were pooled together to fit the overall marketed surplus functions. Similarly, marketed surplus functions were fitted after pooling the data of non-member households of both the patterns. Further, the regression equations were developed for different seasons for two categories of households viz., landless labourers and cultivators. Data of all farm size groups viz., marginal, small, medium and large were pooled together under cultivator's category.

Thus, the results of the regression analysis obtained for member and non-member households separately are given in Tables 17 and 18 respectively.

A close examination of Tables 17 and 18 reveals that the regression coefficients of milk production variable were positive and highly significant on landless labour and cultivating households of member and non-member groups indicating thereby its substantial and positive impact on marketed surplus of milk in the study area. It was observed that the regression coefficients of monthly disposable income was found to have positive and significant impact on marketed surplus of milk in summer season only on cultivating non-member households.

The size of family was also found to have negative impact on marketed surplus of milk in summer season on landless labour households of member group and in winter season on cultivating non-member households. It is interesting to note that the variable of education score; by and large had negative influence on marketed surplus of milk in summer season on landless labour households of member groups while it had negative impact on marketed surplus of milk in only winter season on landless labour households and in rainy season on cultivating households of non-member group. This indicated that with an increase in the level of education there was a decline in marketed surplus of milk because educated and enlightened people preferred to consume more milk in the family due to its high nutritive value.

Table 17: Overall Marketed Surplus Functions on Member Households.

Category/ Season/ Equations	No. of obser- vation	Inter- cept	Regression Coefficients of Independent Variables						R <sup>2</sup>
			milk prod- uc- tion (X <sub>1</sub> )	Dispos- able income (X <sub>2</sub> )	Family Size (X <sub>3</sub> )	Education Score (X <sub>4</sub> )	Price of milk (X <sub>5</sub> )	Value of milch animal (X <sub>6</sub> )	
<b>Landless</b>									
<b>Labour</b>									
Rainy Linear	39	-2.6337 <sup>A</sup>	0.7540 <sup>***</sup> (0.0314)	0.0005 (0.0008)	0.1396 <sup>A</sup> (0.0752)	-0.1676 (0.1200)	1.2107 <sup>**</sup> (0.5383)	-0.0002 (0.0002)	0.9574
Winter Linear	45	-0.5813	0.6906 <sup>**</sup> (0.0355)	0.0009 (0.0007)	-0.0802 (0.0690)	-0.0348 (0.1151)	0.8233 <sup>A</sup> (0.4804)	-0.0002 (0.0003)	0.9268
Summer Linear	40	0.0004	0.7554 <sup>***</sup> (0.0448)	-0.0005 (0.0007)	-0.1356 <sup>*</sup> (0.0701)	-0.3573 <sup>***</sup> (0.1065)	0.1621 (0.4539)	0.0005 <sup>*</sup> (0.0003)	0.9139
<b>Cultivator</b>									
Rainy Cobb Douglas	82	-5.4206	0.7472 <sup>***</sup> (0.0927)	0.0507 (0.0570)	-0.0156 (0.1236)	-0.0025 (0.0243)	0.5585 (0.4127)	0.6285 <sup>**</sup> (0.2031)	0.6832
Winter Cobb Douglas	71	-1.6922	0.8946 (0.0722)	0.0350 (0.0366)	0.0976 (0.0807)	-0.0164 (0.0175)	0.2283 (0.3018)	0.1281 (0.1301)	0.7957
Summer Linear	61	-0.3771	0.7063 <sup>***</sup> (0.0303)	-0.0085 (0.0003)	0.0087 (0.0557)	-0.0921 (0.0686)	0.3769 (0.4769)	-0.0000 (0.0001)	0.9180

\*\*\* significant at 1 percent level  
 \*\* significant at 5 percent level  
 \* significant at 10 percent level

Table 18: Overall Marketed Surplus Functions on Non-member Households.

Category/ Season/ Equations	No. of obser- vations	Inter- cept	Regression Coefficients of Independent Variables						R <sup>2</sup>
			milk produc- tion/ day (X <sub>1</sub> )	Dispos- able income (X <sub>2</sub> )	Family size (X <sub>3</sub> )	Education score (X <sub>4</sub> )	Price of milk (X <sub>5</sub> )	Value of milch animal (X <sub>6</sub> )	
<u>Landless</u>									
<u>Labour</u>									
Rainy	16	-3.3228	0.8727 *** (0.1524)	0.0921 (0.0773)	0.1915 (0.0115)	-0.0243 (0.0235)	0.5001 (0.5231)	-0.0897 (0.1681)	0.8949
<u>Cobb Douglas</u>									
Winter	17	-0.5257	0.9345 *** (0.0316)	-0.0006 (0.0004)	0.0532 (0.0466)	-0.2678 (0.1077)	0.0893 (0.5007)	0.0001 (0.0002)	0.9927
<u>Linear</u>									
Summer	15	-1.6402	0.8904 *** (0.0412)	-0.0004 (0.0004)	0.0189 (0.0358)	0.1015 (0.1077)	0.0051 (0.0025)	-0.0001 (0.0001)	0.9883
<u>Linear</u>									
<u>Cultivator</u>									
Rainy	25	2.1147	0.9086 *** (0.0461)	0.0005 (0.0010)	-0.1169 (0.1919)	-0.2036 (0.1171)	0.0584 (0.9112)	-0.0008 (0.0004)	0.9716
<u>Linear</u>									
Winter	25	0.8839	0.9452 *** (0.0682)	-0.0007 (0.0011)	-0.3689 (0.2165)	0.1395 (0.1970)	0.7427 (1.1506)	-0.0008 (0.0004)	0.9358
<u>Linear</u>									
Summer	22	4.7115	0.8144 *** (0.0682)	0.0018 (0.0007)	-0.1627 (0.1656)	0.1693 (0.1242)	1.0839 (0.6847)	-0.0001 (0.0003)	0.9239
<u>Linear</u>									

\*\*\* Significant at 1 percent level

\*\* Significant at 5 percent level

\* Significant at 10 percent level

The price of milk variable, however, had positive influence on marketed surplus of milk in rainy and winter seasons especially on landless labour households on member group and in summer season on landless labour households of non-member group. Thus, it may be concluded that increase in price of milk could not only boost up marketed surplus of milk but it could also increase milk production especially on landless labour households. Thus, it can serve as a tool to have more marketed surplus of milk which would, in turn, provide additional income to this vulnerable class of weaker sections.

#### 5.5.1 Human Labour Employment in Dairy Enterprise:

Human labour represents an important component in the cost structure of dairy enterprise. It is, therefore, essential to estimate the magnitude of employment available and simultaneously assess the effect of dairy co-operatives on this parameter on member households and compare it with that of non-member households. The labour employment per household and per standard animal unit was, therefore, worked out on member and non-member households of both the patterns and are brought out in table-19.

The perusal of table-19 revealed that the overall average per household employment was higher on member households (440 man days) than that of non-member households (365 man days)

Table 19: Employment Pattern in Dairy Enterprise.

Category of households.	(Man days/annum)											
	Anand Pattern				U.P. Pattern				Overall			
	Member		Non-member		Member		Non-member		Member		Non-member	
	Per house hold	Per S.A.U	Per house hold	Per S.A.U	Per house hold	Per S.A.U	Per house hold	Per S.A.U	Per house hold	Per S.A.U	Per house hold	Per S.A.U
Landless labour	398.66 <sup>**</sup>	123.14	309.46	88.58	329.71	103.00	314.71	96.96	364.18	113.07	312.08	92.77
Marginal	465.49 <sup>***</sup>	96.81	315.99	76.88	368.95	94.00	335.19	79.74	417.22 <sup>**</sup>	95.40	325.58	77.96
Small	508.66	76.88	357.70	57.94	383.25	72.48	351.13	75.64	445.95	74.68	354.41	66.79
Medium	543.85	73.01	474.50	55.26	446.51 <sup>**</sup>	71.17	374.90	62.17	495.18 <sup>***</sup>	72.09	424.70	58.71
Large	755.35 <sup>***</sup>	69.87	800.56	46.67	559.66 <sup>**</sup>	66.23	419.99	59.09	657.60 <sup>***</sup>	68.05	610.27	52.88
Overall	482.65 <sup>***</sup>	93.78	381.42	64.10	397.78 <sup>**</sup>	79.73	349.45	74.26	440.27 <sup>***</sup>	86.75	365.43	69.18

S.A.U refers to Standard Animal Unit.

\*\*\* Significant at 1 per cent level

\*\* Significant at 5 per cent level

\* Significant at 10 per cent level.

and was found to be statistically significant. This indicated that the member households devoted more time in the maintenance and up-keep of animals as compared to that of non-member households. Thus, it may be concluded that the dairy co-operatives had positive impact on labour employment in dairy enterprise on member households. It was, further, observed that the human labour employment per household increased with an increase in the farm size due to obvious reasons. However, human labour employment per standard animal unit had inverse relationship with farm size both on member and non-member households. It is interesting to note that the labour employment per household on landless labour, marginal and medium farms of member group was significantly higher than that of non-member households. It was further observed that the overall labour employment was significantly higher on member households than that of non-member households in both the patterns. The table further revealed that labour employment was significantly higher on landless labour and marginal farm households of the member group as compared to that of non-member households of Anand pattern. It may be observed that the labour employment on medium and large farms was higher and statistically significant on member households as compared to that of non-member households in U.P. patterns. Thus, it leads one to conclude that, by and large, dairy co-operatives made a positive influence on per household employment in dairy enterprise.

### 5.5.2 Income from Dairy Enterprises:

Income is the most important indicator of economic status of the household. It has been experienced that the farm income directly affects the investment, productivity, consumption and savings. Therefore, with a view to examining the impact of dairy co-operatives on income, data were analysed and net income per household and per milch animal were worked out for member and non-member households of different categories in both the patterns and the same are brought out in Table-20.

Examination of Table-20 revealed that the overall average net income per household and per milch animal was about Rs. 1156 and Rs. 524 respectively on member households as against Rs. 1398 and Rs. 776 on non-member households. It may be observed that the net income of Rs. 724 per milch animal was the highest on medium farms followed by about Rs. 609 on small farms of the member group. Interestingly, the net income per milch animal, in case of non-member households was the highest on landless labour households followed by marginal farmers. It was further noted that the net income per milch animal on large farms of member group was statistically significant and higher from that of the large farms of non-member households. The table further revealed that overall per household net income was higher on member households than that of non-member households of Anand Pattern while the reverse was true in U.P.

Table 20: Net Income from Dairy Enterprise.

(In Rupees/annum.)

Category of households.	Anand Pattern				U.P. Pattern				Overall			
	Member		Non-member		Member		Non-member		Member		Non-member	
	Per house hold	Per milch animal	Per house hold	Per milch animal	Per house hold	Per milch animal	Per house hold	Per milch animal	Per house hold	Per milch animal	Per house hold	Per milch animal
Landless labour	735.30	342.29	892.95	650.59	740.71	416.65	2556.90	1770.16	737.47	368.73	1537.07	1105.41
Marginal	905.08	366.92	1019.12	792.65	1207.58	905.68	980.07	633.37	1039.53	529.56	987.25	713.01
Small	1597.77	435.75	1182.32	443.36	1369.86	880.62	1760.06	880.03	1461.02	609.75	1543.41	685.95
Medium	2305.06	1383.03	1316.55	789.93	1395.66	550.91	1446.78	675.16	1655.49	724.27	1407.71	703.89
Large	1964.51	736.69	820.85	307.51	1096.78	387.10	2260.77	565.19	1530.65	556.59*	1540.41	462.12
Overall	1143.89	479.95	991.73	601.05	1127.80	578.35	1814.09	922.41	1135.85	524.23	1397.91	776.61

\*significant at 10 per cent level.

Pattern. It was further noted that average net income per milch animal was lower on member households as compared to that of non-member households of Anand Pattern. In case of U.P. Pattern, the average net income per household and per milch animal was lower on member households as compared to that of non-member households. Thus, it leads one to conclude that dairy co-operatives could not make positive impact on the net income from dairy enterprise on most of the categories of member households. This could be attributed to the poor or negligible facilities provided to the members of the dairy co-operatives. If we want dairy co-operatives to succeed in raising the level of milk production and income on the member households then adequate provision of required facilities of artificial insemination, health cover, supply of feed and fodder, seeds, credit, in addition to milk marketing must be made by the co-operatives in an integrated manner.

#### 5.6 Milk Production Functions:

This section of the chapter deals with the milk production functions developed for different seasons and categories of households separately. The milk production is a complicated process which is influenced by a number of factors. In fact, not much is known about the nature of milk production surface and type of mathematical model suitable to predict the milk production process. Therefore, efforts were

made to fit linear, Cobb-Douglas and Semi-log production functions. The best fit models were finally chosen for further economic analysis on the basis of its inherent conformity to economic logic, value of the coefficient of multiple determination, number of significant variables appearing in the equation and also the significance level of the regression coefficients of variables. In the present study, separate milk production functions turned out to be the best fit in different seasons, which were finally chosen for further economic analysis. The decision to select the models were in conformity with the similar models used earlier and the results reported by Orton (1958), Panse et al. (1961), Dhondhyal and Singh (1965), Jacob et al. (1971), Agrawal et al. (1974), Patel et al. (1976), Gangadharan (1978), Rao and Singh (1980), Sharma (1982). Several studies pointed out the fact that in the short run, the resource mix in dairy enterprise follows the linearity. Although, it looks illogical to assume linear function in the milk production process. However, it is plausible that under existing technology, the input output relationships in milk production fell in the linear range of a curvi-linear production surface.

Seasonal milk production functions were, thus, fitted to the data for buffaloes only owned by labour and cultivator households of members and non-member sample households of both

the patterns and for overall situation. The regression equations were developed for buffaloes in two categories viz., landless labour households and cultivators. All farm size groups viz., marginal, small, medium and large were pooled under cultivators' category. Regression equations could not be developed for crossbred and local cows because the number of these animals were not adequate for regression analysis on member and non-member households of both the patterns. The results of the regression analysis done for two categories of households are discussed in the section that follows:

#### 5.6.1 Milk Production Functions - Anand Pattern:

The regression equations for lactating buffaloes maintained by landless labour households of member and non-member groups in Anand Pattern were developed and are given in Table 21.

It may be observed from Table-21 that the variables of value of green fodder, dry fodder, concentrate, human labour cost and veterinary expenses per day, value of milch animal, order of lactation and stage of lactation explained about 82 to 87 per cent of variation in milk production per day in different seasons as indicated by the coefficients of multiple determination ( $R^2$ ).

It was noted that the regression coefficient of value of green fodder was positive and statistically significant in rainy season on member group of landless labour households and

Table 21: Seasonal Milk Production Functions on Landless Labour Households of Member and Non-member Groups in Anand Pattern.

Groups/ Equations/ Seasons.	No. of obser- va- tion.	Inter- cept.	Regression Coefficients of Independent Variables								R <sup>2</sup>
			Value of Green Fodder (X <sub>1</sub> )	Value of Dry Fodder (X <sub>2</sub> )	Value of Concen- trate (X <sub>3</sub> )	Veteri- nary Expen- ses. (X <sub>4</sub> )	Human labour Cost (X <sub>5</sub> )	Value of Milch Animal (X <sub>6</sub> )	Order of lac- tation (X <sub>7</sub> )	Stage of lac- tation. (X <sub>8</sub> )	
<u>Member</u>											
Rainy Cobb Douglas	34	2.9534	.1365* (.0924)	-.0348 (.0293)	.6792*** (.0728)	-.0553 (.0998)	.0077 (.0142)	-.2210*** (.0336)	.0018 (.0536)	-.0408* (.0248)	.9593
Winter Cobb Douglas	47	.8412	-.0700 (.1623)	.2848** (.1109)	.4196*** (.0777)	.3049** (.1373)	.0154 (.0289)	.0099 (.1090)	.0389 (.0556)	-.0684* (.0364)	.9200
Summer Cobb Douglas	31	.3651	.2134 (.1676)	.3447* (.2391)	.4887*** (.1157)	.0753 (.1636)	-.0273 (.0422)	.1297 (.1997)	.0295 (.0884)	-.3457*** (.1639)	.8219
<u>Non-member</u>											
Rainy Cobb Douglas	17	2.9635	.3993* (.2411)	.4822** (.1768)	.4798*** (.1078)	.0834 (.3461)	-.0835** (.0339)	-.2855* (.1791)	-.2101* (.1307)	-.0043 (.0676)	.9704
Winter Cobb Douglas	17	-2.5710	.9347* (.5345)	-.6228*** (.1804)	.6664*** (.1895)	.6012 (.5770)	-.0902* (.0497)	.3321** (.1442)	.2870 (.1836)	-.0515 (.1014)	.9150
Summer Cobb Douglas	13	1.9544	-.2366 (.2444)	-.1436 (.1247)	.2278* (.1434)	-1.6477* (1.0300)	.1396 (.0872)	.1950 (.1167)	.6364** (.1463)	-.7012*** (.1439)	.9744

\*\*\* significant at 1 per cent level.  
 \*\* significant at 5 per cent level.  
 \* significant at 10 per cent level.

in rainy and winter seasons on non-member group. This indicated that per day milk production increased with an increase of green fodder fed per day in the respective seasons. The regression coefficients of value of dry fodder fed per day was negative and statistically significant in winter season only on non-member landless labour households indicating thereby its excessive feeding resulting in the negative impact on per day milk yield in the season. It is interesting to observe that the regression coefficients of value of concentrate variable were positive and statistically significant in all the seasons on member and non-member households. This indicated that this variable had substantial impact on milk production in the study area. The regression coefficient of human labour was positive and statistically significant in winter season only on member households indicating thereby its positive impact on per day milk yield in the season on member households. The regression coefficients of value of milch animal variable were found to be positive and significant in winter and summer seasons on non-member households. The regression coefficients of order of lactation was negatively associated with milk production in rainy season and positively associated in summer season on non-member households. The positive and significant coefficient of this variable indicated that the milk yield increased with the advancement in the order of lactation. The regression coefficient of stage of lactation was negative and statistically significant in all the seasons on member households and in summer

season on non-member households. This indicated that per day milk production declined with the advancement of stage of lactation.

#### 5.6.2 Milk Production Function - Anand Pattern:

The results of the regression equations on cultivators' category of Anand pattern are presented in Table-22.

Examination of Table-22 indicated that the coefficient of multiple determination ( $R^2$ ) ranged from 0.5889 to 0.9017 on the non-member and member cultivator households respectively. This indicated that about 59 to 90 per cent of the variation in milk yield was associated with the included variables in the equations. The regression coefficients of value of green fodder variable was found to be negatively significant in rainy season on non-member households. This indicated the negative impact of green fodder in rainy season on non-member cultivator households. The regression coefficients of dry fodder variable was found to be positive and statistically significant in winter season on member cultivator households and negatively significant in summer season on non-member households. This suggested that the increase in dry fodder feeding in winter season on member households and decrease in summer season on non-member households could help them in increasing per day milk yield. It is interesting to note that the regression coefficients of value of concentrate variable were positive and statistically significant in all the

**Table 22: Seasonal Milk Production Functions on Cultivator Households of Member and Non-member Groups in Anand Pattern.**

Group/ Equation/ Season.	No. of obser- vations	Intercept	Regression Coefficients of Independent Variables								R <sup>2</sup>
			Value of Green fodder (X <sub>1</sub> )	Value of Dry fodder (X <sub>2</sub> )	Value of Concen- trate. (X <sub>3</sub> )	Human Labour cost (X <sub>4</sub> )	Vety. Expn- ses. (X <sub>5</sub> )	Value of milch animal (X <sub>6</sub> )	Order of Lac- tation (X <sub>7</sub> )	Stage of Lac- tation (X <sub>8</sub> )	
<b>Member</b>											
Rainy Semilog	52	-6.4762	.8230 (1.2111)	1.1533 (1.1603)	2.8146 <sup>***</sup> (.4974)	-.3868 (1.5987)	.0159 (.0893)	1.3414 (.9729)	.0639 (.4767)	-.5931 <sup>**</sup> (.2580)	.8272
Winter Semilog	60	-5.1756	.9405 (.7834)	3.0519 <sup>***</sup> (.8366)	2.8672 <sup>***</sup> (.4925)	.2622 (.8598)	-.0320 (.0706)	.8549 (.5500)	-.5617 <sup>**</sup> (.3178)	-.1649 (.2230)	.8729
Summer Semilog	49	3.9597	.0525 (.5224)	.2734 (.2964)	1.8677 <sup>***</sup> (.2038)	.4386 (.7402)	.0898 <sup>*</sup> (.0659)	.2350 (.3279)	.3919 <sup>*</sup> (.2294)	-1.6993 <sup>***</sup> (.3185)	.9017
<b>Non-member</b>											
Rainy Linear	26	6.3401	-1.9569 <sup>**</sup> (.7877)	-.0888 (.6601)	1.9736 <sup>**</sup> (.4930)	-1.6132 <sup>**</sup> (.6085)	.1482 (.2133)	.0011 <sup>†</sup> (.0004)	.1102 (.3218)	-.1656 (.1836)	.8659
Winter Cobb Douglas	27	-1.0489	-.0303 (.3685)	-.1112 (.2621)	.5323 <sup>**</sup> (.3158)	-.3920 (.2181)	-.0398 (.0641)	.2942 (.3141)	.0030 (.1591)	.1620 (.1876)	.5889
Summer Linear	27	1.8578	-.4938 (.4932)	-.4033 (.2575)	1.2651 (.2586)	-.1031 (.1860)	.0740 (.1302)	.0000 (.0002)	.0098 (.1125)	-.0645 (.0395)	.7771

\*\*\* Significant at 1 per cent level  
 \*\* Significant at 5 per cent level  
 \* Significant at 10 per cent level

seasons on both member and non-member households. The regression coefficient of concentrate variable was the highest (2.8672) in winter season on member households indicating the maximum impact of concentrate on milk yield in winter season. Further the concentrate variable appear to have the most powerful influence on the milk yield in all the seasons. The regression coefficients of human labour were negatively significant in rainy and winter seasons on non-member households indicating thereby its negative influence on milk yield. It was observed that the coefficient of veterinary expenses was positive and statistically significant in summer season only on member households. This indicated that the veterinary expenses incurred on vaccination and treatment in summer season had positive impact on milk yield on member households. The regression coefficient of value of milch animal variable was positive and statistically significant in winter season on member households and in rainy season on non-member households. This indicated that the high market value of buffaloes, which is proxy for the quality of animal, had positive and significant influence on daily milk yield. The regression coefficients of stage of lactation variable was found to be negative and statistically significant in rainy and summer seasons on member households only.

### 5.6.3 Milk Production Functions- U.P. Patterns

The results of the regression equations developed for buffaloes maintained by the landless labour group of member and non-member households in the study are given in Table-25.

It may be observed from Table-25 that the variables of green fodder, dry fodder, concentrate, human labour cost, veterinary expenses, order of lactation and stage of lactation together explained about 85 and 95 per cent of variation in milk production per day in different seasons as indicated by the coefficients of multiple determination ( $R^2$ ). It was noted that the regression coefficients of green fodder were positive and statistically significant in rainy and winter seasons on member group and only in summer season on non-member group of households. This indicated that green fodder had positive impact on per day milk yield in the respective seasons on member and non-member households. The dry fodder was found to have positive impact on milk production in winter and summer seasons on member households. It is interesting to observe that the regression coefficients of concentrate variable were positive and statistically significant in all the seasons on member households and in rainy and winter seasons on non-member group of landless labour households. Therefore, it may be concluded that per day milk yield could be increased by increasing the feeding of concentrate.

Table 23: Seasonal Milk Production Functions on Landless Labour Households on Member and Non-member Groups in U.P. Pattern.

Group/ Equation/ Season.	No. of obser- va- tions.	Inter- cept.	Regression Coefficients of Independent Variables								r <sup>2</sup>
			Value of Green fodder (X <sub>1</sub> )	Value of Dry fodder (X <sub>2</sub> )	Value of Concen- trate. (X <sub>3</sub> )	Value of Human labour cost (X <sub>4</sub> )	Value of Vety. Exp- enses (X <sub>5</sub> )	Value of milch animal (X <sub>6</sub> )	Order of of lacta- tion. (X <sub>7</sub> )	stage of lacta- tion. (X <sub>8</sub> )	
<u>Member</u>											
Rainy Cobb Douglas	20	3.6431	.4196* (.2326)	.0957 (.1581)	.4467*** (.1164)	.3458* (.2239)	-.0089 (.0213)	-.3656** (.1465)	-.0561 (.0674)	.0153 (.0407)	.9157
Winter Semi-log	24	12.5283	2.2256** (.7979)	2.0359*** (.6518)	1.9215* (.7165)	-.1666 (1.2488)	-.1360* (.0970)	-1.2554* (.8859)	-.2966 (.5499)	-.4748 (.2681)	.8871
Summer Cobb Douglas	21	1.7763	.0098 (.1858)	.4035* (.2102)	.5197** (.0945)	.5384* (.2653)	.1099** (.0370)	-.0955 (.1316)	-.1020 (.0939)	-.0577 (.1000)	.9535
<u>Non-member</u>											
Rainy Linear	13	4.1697	-.0723 (.7574)	1.1330 (1.1886)	2.2017** (.6137)	-2.9294 (7.7724)	-.0920 (.5712)	.0004 (.0008)	.1086 (.2475)	-.1255 (.1040)	.9474
Winter Cobb Douglas	13	-2.2903	.1310 (.5023)	.0142 (.5862)	.7570* (.4033)	-.7499 (2.3122)	-.1486 (.2957)	.4836 (.8802)	-.3160 (.4113)	.0831 (.4728)	.8529
Summer	11	-3.2118	2.8124* (1.6738)	-.0995 (.5063)	-.2100 (.6078)	3.8880 (7.3425)	3.7515 (8.4406)	-.0018 (.0012)	-1.3861** (.3942)	.2570 (.2287)	.9540

\*\*\* significant at 1 per cent level  
 \*\* significant at 5 per cent level  
 \* significant at 10 per cent level

The regression coefficient of human labour cost variable was positive and statistically significant in rainy and summer seasons on member group of households. This indicated that the human labour use in the maintenance of buffaloes had positive impact on per day milk yield in rainy and summer seasons on member households. The regression coefficients of value of milch animal were negatively significant in rainy and winter seasons on member households and only in summer season on non-member households. This indicated that value of animal did not have positive association with milk yield due to prevailing market imperfections in the study area.

#### 5.6.4 Milk Production Functions - U.P. Pattern:

The results of the seasonal milk production functions fitted to the data for buffaloes owned by the cultivator households of member and non-member group of U.P. pattern are given in Table-24.

The close examination of Table-24 revealed that 76 to 86 per cent of variation in milk yield was associated with the included variables in the equations. The table further revealed that green fodder, dry fodder and concentrates in all seasons were found to have positive influence on milk yield on member cultivator households as reflected by their regression coefficients. Therefore, there existed enough scope for increasing milk yield by feeding increased quantities of feeds and fodders. Almost similar situation existed on non-member households with regard to above stated variables.

Table 24: Seasonal milk Production Functions on Cultivator Households of Member and Non-member Groups in U.P. Pattern.

Group/ Equation/ Season.	No. of obser- va- tions.	Inter- cept.	Regression Coefficients of Independent Variables								
			Value of Green Fodder (X <sub>1</sub> )	Value of Dry Fodder (X <sub>2</sub> )	Value of Concen- trate (X <sub>3</sub> )	Human labour cost (X <sub>4</sub> )	Vety. Expen- see (X <sub>5</sub> )	Value of milch animal (X <sub>6</sub> )	Order of lacta- tion (X <sub>7</sub> )	Stage of lacta- tion. (X <sub>8</sub> )	R <sup>2</sup>
<b>Member</b>											
Rainy Cobb Douglas	60	1.5826	.1392 (.1139)	.4337 (.1053)	.6520 (.0888)	.3686 (.1582)	.0091 (.0177)	-.1252 (.0765)	-.0481 (.0565)	-.0484 (.0339)	.8331
Winter Cobb Douglas	66	-.1664	.2930 (.1279)	.26666 (.0996)	.4252 (.0899)	.2999 (.1620)	-.0029 (.0160)	.1162 (.0923)	-.0097 (.0782)	-.0659 (.0450)	.7613
Summer Cobb Douglas	55	.4527	.0807 (.1389)	.1777 (.1330)	.5574 (.0656)	.2878 (.1576)	.0695 (.0246)	-.0698 (.1129)	-.0928 (.0927)	-.0523 (.1203)	.7997
<b>Non-member</b>											
Rainy Cobb Douglas	32	-.9160	.4738 (.2139)	.0564 (.0961)	.6374 (.1219)	-.5192 (.2707)	.0091 (.0213)	.2468 (.1399)	.1058 (.0829)	.0993 (.0730)	.8315
Winter Cobb Douglas	39	2.3054	.1873 (.1428)	.2718 (.1075)	.8764 (.0494)	-.7523 (.1295)	.0104 (.0144)	-.2181 (.0895)	-.0452 (.0502)	.0079 (.0367)	.9420
Summer Cobb Douglas	29	.3461	.0226 (.2454)	.4109 (.2664)	.5354 (.0975)	-.3163 (.1904)	.0002 (.0297)	.0990 (.1702)	-.0252 (.0853)	-.1362 (.1308)	.8639

\*\*\* Significant at 1 per cent level  
 \*\* Significant at 5 per cent level  
 \* Significant at 10 per cent level

The regression coefficients of human labour was found to have positive and significant impact in all the seasons on member households; however, reverse was true on non-member households in all the seasons. Thus, it implied that the human labour variable had positive influence on milk production on member households and negative impact on non-member households. The regression coefficient of veterinary expenses variable was positive and statistically significant in summer season on member households. This indicated that the variable had significant and positive influence on daily milk yield.

#### 5.6.5 Milk Production Functions in Overall Situation:

With a view to examining the influence of various factors on member and non-member households, the data were pooled for member and non-member households of both the pattern separately. The seasonal milk production functions were, thus, fitted to the data pertaining to landless labour households of member and non-member groups of both the patterns and the results of the same are presented in Table 25.

It may be seen from Table-25 that the included variables in the equations explained about 63 and 92 per cent of variation in milk production per day in different seasons as indicated by the coefficients of multiple determination ( $R^2$ ). The regression coefficients of green fodder, dry fodder and concentrate variables were positive and statistically

**Table 25: Seasonal Milk Production Functions on Landless Labour Households of Member and Non-member Groups in overall situation.**

Groups/ Equations/ Seasons	No. of obser- vations	Inter- cept.	Regression Coefficients of Independent Variables								
			Value of Green fodder (X <sub>1</sub> )	Value of Dry fodder (X <sub>2</sub> )	Value of Concen- trate (X <sub>3</sub> )	Human Labour cost (X <sub>4</sub> )	Usty. Expn- ses. (X <sub>5</sub> )	Value of milk animal tion (X <sub>6</sub> )	Order of lacta- tion (X <sub>7</sub> )	Stage of la- cta- tion. (X <sub>8</sub> )	
<u>Member</u> Rainy Semi-log	54	15.9402	2.2002 <sup>***</sup> (.4688)	.2304 (.2032)	2.5332 <sup>***</sup> (.3182)	.2592 (.4041)	.0437 (.0635)	-1.6823 <sup>***</sup> (.3338)	-.2831 (.2037)	-.1865 (.1232)	.8978
Winter Semi-log	71	6.2250	1.3039 <sup>***</sup> (.5686)	1.4377 <sup>***</sup> (.3590)	2.0925 <sup>***</sup> (.3438)	.4598 (.5853)	-.0403 (.0691)	-.5291 <sup>*</sup> (.4036)	.2810 (.2410)	-.4336 <sup>***</sup> (.1503)	.8648
Summer Cobb-Douglas	52	.7674	.1690 <sup>*</sup> (.1172)	.2152 <sup>*</sup> (.1462)	.5793 <sup>***</sup> (.0697)	.0644 (.1245)	.0058 (.0247)	.0471 (.1084)	.0417 (.0591)	-.1346 <sup>*</sup> (.0864)	.8432
<u>Non-member</u> Rainy Cobb-Douglas	30	2.8388	.4765 <sup>**</sup> (.1853)	.5920 <sup>**</sup> (.1446)	.6456 <sup>***</sup> (.0907)	-.3033 (.3892)	-.0095 (.0191)	-.1317 (.1200)	-.1296 <sup>*</sup> (.0959)	.0246 (.0479)	.9242
Winter Cobb-Douglas	30	-1.2973	.0916 (.2251)	-.5401 <sup>***</sup> (.2296)	.9252 <sup>***</sup> (.1713)	.2382 (.6763)	-.0492 (.0556)	.2795 <sup>*</sup> (.1791)	-.0889 (.1590)	.0223 (.1239)	.7420
Summer Cobb-Douglas	24	3.3129	-.1871 (.2560)	.1450 (.1699)	.2633 <sup>***</sup> (.1433)	-3.5538 <sup>***</sup> (1.0663)	-.0640 (.0654)	.1640 (.1554)	-.0703 (.1480)	-.1670 <sup>*</sup> (.2533)	.6335

\*\*\* significant at 1 per cent level  
 \*\* Significant at 5 per cent level  
 \* Significant at 10 percent level

significant in almost all the seasons on the labour households of member group indicating thereby their positive impact on milk yield. However, in case of non-members, green and dry fodder in rainy season, and concentrate in all the seasons were found to have their positive effect on milk yield. The negatively significant coefficient of dry fodder in winter season on non-member households indicated its excessive feeding. Therefore, it may be suggested that dry fodder feeding should be reduced in this season for increased milk production. The regression coefficients of human labour in summer season and that of veterinary expenses in winter and summer seasons showed their negative influence on milk yield on non-member households. The regression coefficients of stage of lactation variable were found to be negative and statistically significant in winter and summer seasons on member households and only in summer season on non-member households. This supported the biological nature of lactation curve that as the stage of lactation advanced the milk production declined.

#### **5.6.6 Milk Production Functions in Overall Situation:**

Seasonal milk production functions were fitted to the data for buffaloes owned by cultivators, pooling all categories of cultivators of member and non-member groups separately of both the patterns whose results are given in Table-26.

The perusal of table-26 indicated that the included variables in the equations explained about 76 and 82 per cent

**Table 26: Seasonal Milk Production Functions on Cultivator Households of Member and Non-member Groups in Overall Situation.**

Groups/ Equations/ Seasons.	No. of obser- vations.	Inter- cept.	Regression Coefficients of Independent Variables							r <sup>2</sup>	
			Value of Green Fodder (X <sub>1</sub> )	Value of Dry Fodder (X <sub>2</sub> )	Value of Concen- trate (X <sub>3</sub> )	Human Labour Costs (X <sub>4</sub> )	Expen- ses. (X <sub>5</sub> )	Value of Milch Animal (X <sub>6</sub> )	Order of Lacta- tions (X <sub>7</sub> )		Stage of Lacta- tions. (X <sub>8</sub> )
<b>Member</b>											
Rainy Cobb-Douglas	112	.9578	.0305 (.0970)	*** .3256 (.0960)	*** .6472 (.0966)	* .2291 (.1131)	-.0104 (.0105)	-.0021 (.0680)	.0161 (.0437)	-.0239 (.0267)	.8130
Winter Cobb-Douglas	126	-1.0254	.1128 (.0889)	*** .3155 (.0785)	*** .4654 (.0592)	*** .3490 (.0991)	-.0016 (.0103)	.2340 (.0598)	-.0282 (.0462)	-.0517* (.0307)	.7857
Summer Cobb-Douglas	104	.5004	.0547 (.1049)	** .1062 (.0342)	** .5370 (.0724)	** .2221 (.1090)	.0205 (.0163)	.0701 (.0739)	-.0517 (.0587)	-.1067 (.0749)	.8003
<b>Non-member</b>											
Rainy Cobb-Douglas	58	-1.8586	.0080 (.1674)	* .1573 (.0777)	*** .7355 (.0903)	** -.3287 (.1403)	.0275 (.0192)	.4134 (.1003)	.0009 (.0722)	-.0010 (.0508)	.7797
Winter Cobb-Douglas	66	1.1333	.1782 (.1506)	** -.1440 (.0960)	*** .8471 (.0654)	*** -.4238 (.1124)	.0116 (.0187)	.0200 (.0820)	-.0412 (.0595)	.0350 (.0472)	.8276
Summer Cobb-Douglas	56	1.0533	.1948 (.1558)	-.0936 (.1085)	*** .6033 (.0710)	** -.1824 (.1013)	.0192 (.0134)	.0609 (.0890)	.0074 (.0619)	-.2128** (.1039)	.7658

\*\*\* Significant at 1 per cent level  
 \*\* Significant at 5 per cent level  
 \* Significant at 10 per cent level

of the variation in milk production per day in different seasons as indicated by coefficients of multiple determination ( $R^2$ ). Interestingly, the regression coefficients of green fodder were not found statistically significant in any season on both the groups of member and non-member households. However, the regression coefficients of dry fodder were found positive and statistically significant in all the seasons on member cultivator households and only in rainy season on non-member households. This included that there was excessive feeding of green fodder and very low level feeding of dry fodder on these households. Therefore, necessary adjustment in feeding was needed for increased milk production. It is interesting to note that the regression coefficients of concentrate were positive and highly significant in all the seasons on both the groups of households. This indicated that the milk yields could be increased by feeding increased quantities of concentrates on member and non-member households. The regression coefficients of human labour were found to be positive and statistically significant in all the seasons on member households. This implied that human labour had positive influence on milk production in all the seasons. However, this variable was negatively associated with milk yield in all the seasons on non-member households. The coefficient of veterinary expenses variable was found to have significantly positive influence in only summer season on member households. The

Regression coefficients of value of milch animal were positive and statistically significant in winter season on member households and in rainy season on non-member group of households. This indicated that higher value of milch animal was positively associated with higher milk yield on these households. Thus, it may be concluded from the above results of regression analysis that per day milk yield of buffaloes could be increased through making rational adjustments in the use of different resources.

#### 5.6.7 Marginal Value Productivity:

The marginal physical products and marginal value products (MVPs) of relevant inputs like green fodder, dry fodder, concentrate and human labour used in the process of milk production were computed at their geometric mean/mean levels on member and non-member households and compared with the unit price of the input so that resource use efficiency could be examined and rational adjustment in the use of these inputs could be suggested for maximising the dairy income. Since all the inputs except output were expressed in monetary term in the production functions, the acquisition price of inputs was taken as rupee one. As expected the marginal value products of resources may be positive or negative depending upon the sign of their respective regression coefficients.

### 5.6.8 Marginal Value Productivities of Inputs on Landless Labour Households of Anand Pattern.

Table-27 gives the marginal value products (MVPs) of different inputs, their prices, difference between MVPs and price of inputs along with their standard errors.

It may be observed from Table-27 that the marginal value product of green fodder was negatively significant in winter season on member households and in summer season on non-member households while it was positive and significantly higher than its price in rainy and winter seasons on non-member households. This indicated that there was enough scope for increasing returns by feeding more of green fodder in respective seasons on non-member households. The marginal value product of dry fodder was found to be positive and significantly greater than its acquisition price in summer season on member households and in rainy season on non-member households. This showed that feeding of greater quantities of dry fodder in these seasons could increase returns from dairy enterprise. However, significantly negative MVP of dry fodder in rainy season on member households and in summer season on non-member households indicated excessive feeding of dry fodder in these seasons which has resulted in the loss to the households. The table further revealed that the marginal value products of concentrate were positive and significantly higher than its price in rainy and summer seasons on member households

Table 27: Marginal Value Productivity of Inputs on Landless Labour Household of Anand Pattern.

Particulars	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<u>Green Fodder</u>						
MPP	0.3331	-0.1997	0.6190	0.9587	3.0050	-2.0961
MVP	0.8328	-0.4993	1.5475	2.3968	7.5125	-5.2403
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-0.1672	-1.4993	0.5475	1.3968	6.5125	-6.2403
S.E. of Difference	0.2310	0.4058	0.4190	0.6028	1.3363	0.6110
<u>Dry Fodder</u>						
MPP	-0.1389	0.6048	1.0625	1.0019	-1.3249	-0.2036
MVP	-0.3473	1.5120	2.6563	2.5048	-3.3123	-0.5090
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-1.3473	0.5120	1.6563	1.5048	-4.3123	-1.5090
S.E. of Difference	0.0733	0.2773	0.5978	0.4420	0.4510	0.3118
<u>Concentrate</u>						
MPP	1.3775	0.9231	1.3309	0.9698	1.3085	0.4588
MVP	3.4438	2.3078	3.3273	2.4245	3.2713	1.1470
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.4438	1.3078	2.3273	1.4245	2.2713	0.1470
S.E. of Difference	0.1820	0.1943	0.2878	0.2695	0.4738	0.3585
<u>Human Labour</u>						
MPP	-0.1084	0.5458	0.1207	0.1112	0.9712	-2.0590
MVP	-0.2710	1.3645	0.3018	0.2580	2.4280	-5.1475
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-1.2710	0.3645	-0.6982	-0.7220	1.4280	-6.1475
S.E. of Difference	0.2495	0.3433	0.4090	0.8703	1.4425	2.5750

and in rainy and winter seasons on non-member households. Therefore, it could be suggested that the households could increase their returns through feeding more of concentrate in the respective seasons. The highest marginal value product of concentrate was worked out to be Rs. 2.44 in rainy season on member households. This indicated that an increase of concentrate worth rupee one caused an increase in the returns by Rs. 2.44.

As regards the marginal value product of human labour it was found to be negative and statistically significant in rainy season on member households and only in summer season on non-member households indicating thereby excessive use of human labour in the maintenance of buffaloes. Therefore, use of human labour in the respective seasons should be reduced by the households upto the level when its MVP becomes equal to its acquisition cost.

#### 5.6.9 Marginal Value Productivities of Inputs on Cultivator Households of Anand Pattern:

The marginal physical and value products of inputs in different seasons were estimated at geometric mean/mean levels for buffaloes maintained by cultivator households and are presented in Table-28.

A close examination of Table-28 revealed that the marginal value products of green fodder were positive and

Table 28: Marginal Value Productivity of Inputs on Cultivator Households of Anand Pattern.

Particulars	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<u>Green Fodder</u>						
MPP	1.2102	1.7352	0.1384	-1.9569	-0.1015	-0.4938
MVP	3.0405	4.3380	0.3460	-4.8923	-0.2538	-1.2345
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.0405	3.3380	-0.6540	-5.8923	1.2538	-2.2345
S.E. of Difference	3.0278	1.9585	1.3060	1.9693	0.9213	1.2330
<u>Dry Fodder</u>						
MPP	2.0251	1.7852	0.5968	-0.0888	-0.3660	-0.4033
MVP	5.0628	4.4644	1.4920	-0.2220	-0.9150	-1.0083
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	4.0628	3.4644	0.4920	-1.2220	-1.9150	-2.0083
S.E. of Difference	2.9008	2.0915	0.7410	1.6503	0.6553	0.6438
<u>Concentrate</u>						
MPP	2.6273	2.2528	1.9528	1.9736	1.2757	1.2651
MVP	6.5683	5.6321	4.8821	4.9340	3.1893	3.1628
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	5.5683	4.6321	3.8821	3.9340	2.1893	2.1628
S.E. of Difference	1.2435	1.2313	0.5095	1.2325	0.7895	0.6465
<u>Human Labour</u>						
MPP	-0.5214	0.3338	0.6210	-1.6132	-1.5771	0.1031
MVP	-1.3035	0.8345	1.5525	-4.0330	-3.9428	-0.2578
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-2.3035	-0.1655	0.5525	-5.0330	-4.9428	-1.2578
S.E. of Difference	3.9968	2.1495	1.8505	1.5213	0.5453	0.4650

higher than its price but non-significant in all the seasons on member households while it was negatively significant in rainy season on non-member households. This indicated the excessive use of green fodder in rainy season on non-member households. The marginal value product of dry fodder was found positive and significantly higher than its price in winter season on member households and negatively significant on non-member households in winter and summer seasons. The positive and significant MVP indicated that there existed enough scope for increasing returns by feeding more of this input in the respective seasons while negatively significant marginal value products in winter and summer seasons showed excessive use of dry fodder which resulted in the loss to the non-member households. Interestingly, the marginal value products of concentrate were found positive and statistically significant on member and non-member households in all the seasons. This indicated that marginal value products were higher than its acquisition price indicating thereby a greater scope for increasing returns by feeding more of concentrate to buffaloes by both member and non-member households.

The marginal value products of human labour were negative and statistically significant in all the seasons on non-member households. This indicated the excessive use of human labour in the care and maintenance of buffaloes on non-member households. Therefore, human labour use should be decreased by the non-member households.

#### 5.6.10 Marginal Value Productivity of Inputs on Landless Labour Households of U.P. Patterns:

The marginal value products of different inputs in different seasons were worked out at geometric mean/mean levels for buffaloes maintained by landless labour households of member and non-member groups and are brought out in Table-29.

A close look at Table-29 indicated that the marginal value products of green fodder were positive and significant in rainy and winter seasons on member households. This indicated that the marginal value products were higher than the acquisition price of the input in the respective seasons. This suggested that there was enough opportunity of increasing returns by feeding more of green fodder in the respective seasons. The marginal value products of dry fodder were found to be positive and statistically significant in all the seasons on member households. The positive and significant MVP of this input indicated that returns could be increased by feeding more of dry fodder. The marginal value products of concentrate were positive and statistically significant in all the seasons on member households and in rainy and winter seasons on non-member households. This indicated that marginal value products were higher than acquisition price of concentrate. Therefore, it may be concluded that there was enough scope for increasing returns by feeding more of concentrates in the respective seasons.

Table 29: Marginal Value Productivity of Inputs on Landless Labour Households of U.P. Pattern.

Particulars	Members			Non-members		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<u>Green Fodder</u>						
MPP	1.3826	2.2984	0.0425	-0.0723	1.4414	2.8124
MVP	3.4565	5.7461	0.1063	-0.1808	3.6035	7.0310
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.4565 <sup>***</sup>	4.7461 <sup>***</sup>	0.8937	-1.1808	2.6035	6.0310
S.E. of Difference	0.5815	1.9698	0.4645	1.8935	1.2558	4.1845
<u>Dry Fodder</u>						
MPP	1.7768	2.2372	1.4697	1.1330	0.0364	-0.0995
MVP	4.4420	5.5931	3.6743	2.8325	0.0910	-0.2488
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	3.4420 <sup>***</sup>	4.5931 <sup>***</sup>	2.6743 <sup>***</sup>	1.8325	0.9090	-1.2488
S.E. of Difference	0.3953	1.6295	0.5255	2.9715	1.4655	1.2658
<u>Concentrate</u>						
MPP	0.9673	2.6485	2.0900	2.2017	1.7091	-0.2100
MVP	2.4183	6.6213	5.0270	5.5043	4.2728	-0.5250
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	1.4183 <sup>***</sup>	5.6213 <sup>***</sup>	4.0270 <sup>***</sup>	4.5043 <sup>***</sup>	3.2728 <sup>***</sup>	-1.5250
S.E. of Difference	0.2910	1.7913	0.2363	1.5343	1.0003	1.5195
<u>Human Labour</u>						
MPP	0.5992	-0.1761	0.8704	-2.8294	-1.3902	-3.8800
MVP	1.4980	-0.4403	2.1760	-7.0735	-3.4755	-9.7000
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	0.4980	-1.4403	1.1760	-8.0735	-4.4755	-8.7000
S.E. of Difference	0.5395	3.1220	0.6633	19.4310	5.7805	18.3563

SE refers to Standard Error.

It was observed that marginal value products of human labour were positive and higher than its price in rainy and summer seasons on member households but these were not significant in these seasons on member households. However, the MVPs were negative and non-significant in rainy and winter seasons and positive in summer season on non-member households.

#### 8.6.11 Marginal Value Productivity of Inputs on Cultivator Households of U.P. Patterns:

The marginal value products of green fodder, dry fodder, concentrate and human labour in different seasons on member and non-member households of U.P. pattern were estimated at their geometric mean/mean levels and are presented in Table-50.

It may be observed from Table-50 that the marginal value products of green fodder were positive in all the seasons as member and non-member households but were found to be statistically significant only in winter season on member households and in rainy season on non-member group of households. This indicated that the marginal value products were higher than its acquisition price in the respective season. Therefore, it may be concluded that greater scope existed for increasing profits by feeding more of this input in respective seasons on member and non-member households. The marginal value products of dry fodder and human labour use were positive and statistically significant in rainy and winter seasons on member

**Table 3D: Marginal Value Productivity of Inputs on Cultivator Households of U.P. Pattern.**

Particulars	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<b>Green Fodder</b>						
MPP	0.3649	0.7145	0.2097	1.4107	0.5575	0.0599
MVP	0.9123	1.7863	0.5243	3.5268	1.3936	0.1498
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-0.0877	0.7863***	-0.4757	2.5268***	0.3936	-0.8502
S.E. of Difference	0.2848	0.3198	0.3473	0.5348	0.3570	0.6135
<b>Dry Fodder</b>						
MPP	1.5237	0.6206	0.4517	0.2316	0.6818	0.3698
MVP	3.8093	1.5515	1.1293	0.5790	1.7045	2.1745
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.8093***	0.5515**	0.1293	-0.4210	0.7045***	1.1745
S.E. of Difference	0.2633	0.2490	0.3325	0.2403	0.2688	0.6660
<b>Concentrate</b>						
MPP	1.2522	0.7635	1.4798	1.2455	2.3326	1.8151
MVP	3.1305	1.9138	3.6995	3.1138	5.8315	4.5378
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.1305***	0.9138***	2.6995***	2.1138***	4.8315***	3.5378***
S.E. of Difference	0.2220	0.2248	0.1640	0.3048	0.1235	0.2438
<b>Human Labour</b>						
MPP	0.9733	0.7298	0.6177	-2.0207	-2.9360	-1.0644
MVP	2.4333	1.8245	1.5443	-6.0518	-7.3400	-2.6610
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	1.4333***	0.8245	0.5443	-6.0518***	-8.3400***	-3.6610***
S.E. of Difference	0.3455	0.4050	0.3940	0.6768	0.3288	0.4760

\*\*\* Significant at 1 per cent level.

\*\* Significant at 5 per cent level.

SE refers to Standard Error.

households and in winter season only on non-member households. This indicated that returns could be increased by feeding more of dry fodder and using more human labour. Interestingly, the marginal value products of concentrates were positive and significantly higher than its price in all the seasons on member and non-member households. This indicated that the households could substantially increase their profits by increased feeding of concentrates. It was further observed that the marginal value products of human labour were positive and significant in rainy and winter seasons on member households while these were negatively significant in all the seasons on non-member group of households. Therefore, increased use of human labour on member households and decreased use of non-member households in the respective seasons could help the farmers in increasing the returns from dairy enterprise.

#### 5.6.12 Marginal Value Productivity of Inputs on Landless Labour Households in Overall Situations

The marginal value products of various inputs were worked out at geometric mean/mean levels and are presented in Table-31.

A close examination of Table-31 revealed that the marginal value products of green fodder were positive and significant in rainy and winter seasons on member households and in rainy and summer seasons on non-member households.

**Table 31: Marginal Value Productivity of Inputs on Landless Labour Households in Overall situation.**

Particulars	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<b>Green Fodder</b>						
MPP	9.9721	2.4955	0.5588	1.2241	0.4374	1.0344
MVP	23.1232	6.2308	1.3970	3.0503	1.0935	2.5060
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	22.1232 <sup>***</sup>	5.2308 <sup>***</sup>	0.3930	2.0603 <sup>**</sup>	0.0935	1.5860 <sup>*</sup>
S.E. of Difference	1.1720	1.4215	1.3545	0.4633	0.5028	0.6704
<b>Dry Fodder</b>						
MPP	0.9343	2.2897	0.7033	0.0302	-1.2469	0.2954
MVP	2.3356	5.7243	1.7583	1.5756	-3.1173	1.0383
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	1.3356 <sup>***</sup>	4.7243 <sup>***</sup>	0.7583 <sup>**</sup>	0.5756 <sup>*</sup>	-4.1173 <sup>†</sup>	-0.3615
S.E. of Difference	0.3080	0.8975	0.3695	0.3615	0.5740	0.4248
<b>Concentrate</b>						
MPP	2.5917	2.9164	1.7688	1.1849	1.2413	0.7930
MVP	6.4794	7.2910	4.4220	2.9523	4.8533	1.9825
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	5.4794 <sup>***</sup>	6.2910 <sup>***</sup>	3.4220 <sup>***</sup>	1.9523 <sup>***</sup>	3.8533 <sup>**</sup>	0.9825 <sup>**</sup>
S.E. of Difference	0.7955	0.8595	0.1743	0.2268	0.4283	0.3583
<b>Human Labour</b>						
MPP	1.6189	0.5084	0.1035	-0.6020	0.4090	-4.8168
MVP	4.0474	1.2710	0.2588	-1.7350	1.0225	-12.0420
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	3.0474 <sup>***</sup>	0.2710	-0.7412 <sup>**</sup>	-2.5050 <sup>***</sup>	0.0225	-13.0420 <sup>***</sup>
S.E. of Difference	1.2103	1.4633	0.3113	0.9730	1.6908	2.6650

\*\*\* Significant at 1 percent level

\*\* Significant at 5 percent level

SE refers to Standard Error.

This indicated that the marginal value product were higher than its acquisition price. Therefore, it may be concluded that there existed enough scope for increasing profit by feeding more quantities of green fodder in the respective seasons. The marginal value products of dry fodder were positive and significantly higher than its price in all the seasons on member households and only in rainy season on non-member households. The negative and significantly lower marginal value product of dry fodder in winter season showed excessive use of this input which resulted in loss to the households. Interestingly, it was noted that marginal value products of concentrate were found to be positive and statistically significant in all the seasons on member and non-member households. This indicated a substantial scope for increasing profits by feeding more of concentrate in all the seasons on both the groups of households.

It was further observed that the increased use of human labour in rainy season could increase returns on member households.

#### 5.6.13 Marginal Value Productivity of Inputs on Cultivator Households in the Overall Situation:

The marginal value products of inputs in different seasons were estimated at their geometric mean/mean levels for buffaloes and are presented in Table-52.

Table 32: Marginal Value Productivity of Inputs on Cultivator Households in Overall Situation.

Particulars	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<b>Green Fodder</b>						
MPP	0.0344	0.3131	0.1498	0.0224	0.5573	-0.2535
MVP	0.2110	0.7828	0.3745	0.0560	1.5935	-0.6338
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	-0.7890 <sup>***</sup>	-0.2172	-0.6255 <sup>***</sup>	-0.9440 <sup>**</sup>	0.3913	-1.6338 <sup>***</sup>
S.E. of Difference	0.2425	0.2223	0.2623	0.4185	0.3755	0.3995
<b>Dry Fodder</b>						
MPP	1.1391	0.7538	0.4630	0.8318	-0.4033	2.4436
MVP	2.8478	1.8345	1.1575	2.0795	-1.0083	6.1090
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	1.8478 <sup>***</sup>	0.8345 <sup>***</sup>	0.1575	1.0795 <sup>***</sup>	-2.0083 <sup>***</sup>	5.1090 <sup>***</sup>
S.E. of Difference	0.2400	0.1963	0.2105	0.1943	0.2400	0.2713
<b>Concentrate</b>						
MPP	1.2203	0.8810	1.8889	1.4935	2.1480	-0.3632
MVP	3.0508	2.2025	4.7225	3.7338	5.3700	-1.4080
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	2.0508 <sup>***</sup>	1.2025 <sup>***</sup>	3.7225 <sup>***</sup>	2.7338 <sup>***</sup>	4.3700 <sup>***</sup>	-2.4080 <sup>***</sup>
S.E. of Difference	0.1415	0.1480	0.1060	0.2258	0.1635	0.1775
<b>Human Labour</b>						
MPP	0.3982	0.8102	0.4097	-1.3653	-1.6946	0.0101
MVP	1.4955	2.0255	1.0243	-3.4133	-4.2365	0.0253
Price	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Difference	0.4955	1.0255 <sup>***</sup>	0.0243	-4.4133 <sup>***</sup>	-5.2365 <sup>***</sup>	-0.9747 <sup>***</sup>
S.E. of Difference	0.2828	0.2478	0.2740	0.3508	0.2810	0.2533

\*\*\* Significant at 1 percent level  
 \*\* Significant at 5 percent level  
 SE refer to Standard Error.

The perusal of Table-32 revealed that the marginal value products of green fodder were negatively significant in majority of the seasons on member and non-member households. Therefore, it may be suggested that the excessive use of green fodder in the respective seasons on both the groups of cultivator households should be reduced for increasing returns. The marginal value of products of dry fodder, however, were positive and significantly higher than its price in rainy and winter seasons on member households and in rainy and summer seasons on non-member households. Therefore, the cultivator households should increase dry fodder feeding for increased returns in the respective seasons. The marginal value products of concentrate were positive and significant in all the seasons on both the groups of households except in summer season on non-member households where it was negatively significant. This indicated that greater scope for increasing profits by feeding more concentrates existed in majority of seasons on member and non-member households.

It was further observed that the marginal value products of human labour were positive and significantly higher in only rainy season on member households. However, these were negatively significant in all the seasons on non-member households. The negative and low marginal value products of human labour than its acquisition price showed the

excessive use of human labour resulting in the loss to the households. Therefore, it could be suggested to reduce the use of human labour on non-member households for increased returns from dairy enterprises. Thus, it leads one to infer on the basis of the above results of the analysis that the member and non-member households have ample opportunities of increasing returns in different seasons through rational adjustment of various resources in dairy enterprises.

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**CHAPTER VI**

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**SUMMARY AND CONCLUSIONS**

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## SUMMARY AND CONCLUSIONS

Co-operation has been described as the key stone of an arch without which technical knowledge offered from outside will not succeed in supporting a rural economy among million of small farmers and landless labourers. The co-operative movement in India has spread in different fields including dairying. Dairy co-operatives in India are almost as old as the co-operative society act of 1912 under which various types of non-credit societies were registered. The magnitude of success and efficiency of dairy co-operatives vary from one state to another due to various reasons and depend upon different factors. Various weaknesses and shortcomings in the organization and management of co-operatives have been highlighted in the past. But little efforts have, so far, been made in the country to examine empirically the impact of dairy co-operatives on various important economic parameters like resource use pattern, productivity of milch animals, production, consumption and marketed surplus of milk, employment and income, levels of milk producers households and various factors influencing marketed surplus of milk and productivity in different milk shed areas. Keeping this end in view, the present study was undertaken in Western Uttar Pradesh to assess the influence of dairy co-operatives on above parameters. This will not only fill-in the information gap but would also

benefit the milk producers in the study area. The present investigation was taken up with the following specific objectives:

### OBJECTIVES

1. To study the problem pertaining to organization and functioning of dairy co-operatives operating in the study area.
2. To analyse the resource use pattern and productivity of milch animals of different categories of milk producers.
3. To assess the impact of dairy co-operatives on production, consumption and marketed surplus of milk and analyse the factors influencing the marketed surplus.
4. To examine the impact of dairy co-operatives on employment and income patterns of milk producer households.
5. To estimate resource productivity in milk production and suggest readjustment in resource allocation for maximizing income.

There is ample evidence to suggest that the Western Uttar Pradesh is relatively more progressive having milk production potential as compared to other parts of the state. Commensurate with the objectives of study, the multi-stage stratified random sampling technique was used. In order to have comparative picture of problems, performance and impact of the co-operatives, Bulandshahr and Aligarh districts were

purposively selected having societies organised on Anand Pattern and U.P. Dairy Development Pattern respectively which provided suitable background for the present study.

Of the total number of 219 and 159 Primary Co-operative Milk Producers' Societies during 1981-82 in Aligarh and Bulandshahr districts respectively, only 12 societies in each district had been functioning continuously for the last five years. These societies were classified into three categories viz., efficient, less efficient and non-efficient with the help of composite index prepared. Based on the above criteria, three co-operative societies of each type were randomly selected from both the districts. Thus, in all 3 primary co-operative milk producers societies organized on Anand pattern from Bulandshahr district and 3 societies organized on U.P. Dairy Development pattern from Aligarh district were finally selected for the study.

The selection of the sample households, belonging to different categories viz., landless labour having no land, marginal farmers cultivating land upto one hectare, small farmers with 1.01 to 2 hectares, medium farmers with 2.01 to 4 hectares and large farmers with more than 4 hectares was done. Thus, twenty households from each society were randomly selected based on probability proportion to the number of households in each category keeping a minimum of two households in each category.

In order to compare and study the impact of dairy co-operatives, a sample of 60 non-member milk producers of different categories were also selected. Thus, in all, the study included 180 households of different categories from the two districts (120 member households and 60 non-member households).

The primary data for the year 1981-82 were collected from 180 sample households by survey method in the well designed schedule. Tabular and regression analyses were done to achieve various objectives of the study.

The analysis of data pertaining to general features of the sample households, revealed that the overall size of family on member and non-member households was about 6 and 5 persons respectively and there was no marked difference in the literacy status (47 per cent) of member and non-member households. The overall average number of members of the societies belonging to scheduled caste and backward classes was about 34 and 11 per cent respectively in the member group of households. This indicated that the other caste people, constituting about 55 per cent, dominated in the dairy co-operatives. The overall average size of operational holding was 2.08 hectares on both member and non-member households while the average number of milch animals was about 2 on both the groups of households.

In view of the fact that the study area is dominated by buffaloes, efforts should be directed to upgrade the non-descript buffaloes for increased milk production.

Analysis of various organizational problems of dairy co-operatives revealed that the minimum limit of 50 members for the registration was found to be unrealistic for the procurement of desired level of 250 litres of milk per day. Therefore, it is desirable to raise the level of membership from 50 to 50 members. Besides, some suitable means should be devised so that all the members supply milk to the society only. It was observed that in order to provide artificial insemination, treatment and vaccination of animals at the society level, an experienced/trained stockman should be employed to provide the above facilities to the milk producers.

In view of the inadequate working space for milk procurement, it was felt that provision should be made to construct a suitable building for milk procurement and testing etc. Further, the villages which are not connected with metalled roads, should have a motorable road for smooth transport of milk. In view of the existing vested interest and dominance of affluent farmers in the society, suitable measures should be adopted so that the interests of the small milk producers could be safeguarded. The members of these societies expressed their keen desire for undergoing training in dairy farming and co-operative principles and practices so

that they could increase productivity and production of their animals and run their society smoothly and efficiently.

With a view to increasing operational efficiency of the co-operatives, majority of the members felt that their satisfaction may increase manifold if remunerative price of milk and regular payment based on correct measurement of fat, SNF along with milk is done. Besides, provision should be made to provide credit for the purchase of milch animals as well as for meeting consumption requirement in the family. If the facility of providing advances to the members against their expected milk supply is made then the majority of the poor members would not shift their milk supply to the milk vendors. If the above problem encountered by the members are tackled at the society/village level, the efficiency of the society could be increased considerably.

The analysis of data pertaining to resource use pattern revealed that the overall average area under cereal crops was 73 per cent followed by 16 per cent of pulse crops on member households as against 71 and 8 per cent of the total cropped area respectively on non-member households. Nearly 9 per cent of the total cropped area was allocated to fodder crops by both member and non-member households in the study area in Anand Pattern. But in case of U.P. pattern, the average area under fodder crops was only about 7 and 8 per cent of the total

cropped area on member and non-member households respectively. The overall intensity of cropping had inverse relationship with farm size which was worked out to be 136 and 159 per cent on member and non-member households respectively. It was observed that the overall family labour utilization was higher on member households (440 man days) as compared to that of non-member households (368 man days). This indicated that the members of the societies were more conscious of their milch animals and devoted more time to dairy enterprise as compared to non-member households.

The study further revealed that the overall average per household investment was higher on member households (Rs. 14225) as compared to that of non-member households (Rs. 10868). It was observed that investment in cattle-shed was the highest on member and non-member households accounting for about 45 and 40 per cent of the total investment in dairy enterprise respectively while about 38 and 40 per cent of the total investment was made in milch animals on member and non-member households respectively. It was also observed that the average investment in dairy enterprise on member and non-member households of Anand pattern was higher than their counterparts in U.P. Patterns.

It was further observed that the overall average investment per milch animal on different assets of dairy enterprise was Rs. 6868 on member households as against Rs. 6036 on non-member households.

It is interesting to note that the overall average milk yield per lactating animal was higher on member households as compared to that of non-member households. However, the overall average milk yield per milch animal was lower on member households as compared to that of non-member households. The possible reason of lower productivity of milch animals on member households could be found in the higher dry to wet ratio.

The study further revealed that the overall average milk production was although slightly higher for the member households than that of the non-member households, however, the difference was not found statistically significant when 't' test was applied to it. Thus, it leads one to infer that dairy co-operatives, by and large, did not have positive impact on milk production on the member households as reflected by the overall figures. It is interesting to note that the average milk production on member households was significantly higher in Anand Pattern than that of U.P. Pattern.

The milk production on the member households of Anand pattern was found to be significantly higher than that of member households of U.P. pattern. This could be partly attributed to various facilities like provision of subsidised feed and fodder seeds which favourably affected the milk production on the households of Anand Pattern.

It was further observed that overall average per household consumption was almost the same on member (2.19 litres) and non-member households (2.06 litres). Thus, it may be concluded that dairy co-operatives, by and large, did not make positive impact on milk consumption of the member households. It was noted that the overall milk consumption on member households of Anand pattern was higher than that of member and non-member households of U.P. Pattern. It was noted that the overall average per capita availability and consumption of milk was 1155 gm and 368 gm on member households respectively as against 1225 gm and 328 gm on non-member households. It was further observed that the level of per capita availability of milk had close relationship with farm size on member and non-member households in Anand pattern. However, no such trend was visible in U.P. Pattern.

As regards the marketed surplus of milk, it was found to be the same on member (4.66 litres) and non-member households (4.43 litres). This indicated that there was no impact of dairy co-operatives on the marketed surplus of milk on member households. Interestingly, the share of the weaker sections in the total marketed surplus was about 53 per cent on member households as against about 48 per cent on non-member households. However, in case of Anand pattern, the marketed surplus of milk to total production was higher on member households than that of non-member households. The marketed surplus of milk to total milk production (67 per cent) was almost the same on member and

non-member households in U.P. Pattern while it was 69 and 74 per cent on member and non-member households respectively in Anand Pattern.

The results of the overall marketed surplus functions revealed the regression coefficients of milk production variables were positive and highly significant in all the seasons on landless labour and cultivator households of member and non-member groups of the study area. This indicated that milk production had most powerful influence on the marketed surplus. However, the variables of monthly disposable income had only positive impact on marketed surplus only in summer season on cultivator households of the non-member group. The regression coefficients of the family size variables was found to be significantly negative in summer season on landless labour households of member group and in winter season on cultivator households of non-member group indicating thereby its negative impact on marketed surplus. It is interesting to note that the variable of education score was found to have its negative influence in summer season on landless labour households of member group and in winter and rainy seasons on landless labour and cultivator households of non-member group respectively. This indicated that with an increase in education score, there was a decline in marketed surplus of milk. It was further observed that the regression coefficients of price of milk variable, were positive and statistically significant in rainy and winter seasons on landless labour households on member group and only in summer season on landless labour

households on non-member group. Thus, it leads one to conclude that an increase in price of milk can boost up marketed surplus of milk especially on landless labour households of the study area. Thus, milk price, could serve as a tool for increasing not only milk production and marketed surplus but it could eventually provide additional income to the economically weaker sections.

It was further observed that overall per household human labour employment was significantly higher on member households (440 man days) than that of non-member households (365 man days) and was also found to be statistically significant. Thus, it may be concluded that the dairy co-operatives had positive impact on labour employment in dairy enterprise on member households. It was, further, observed that the human labour employment per household increased with an increase in the farm size due to obvious reasons. However, human labour employment per standard animal unit had inverse relationship with farm size both on member and non-member households. It was further observed that the overall labour employment was significantly higher on member households than that of non-member households in both the patterns. Thus, it leads one to conclude that, by and large, dairy co-operatives made a positive influence on per household employment in dairy enterprise.

It was further observed that the overall average net income per household and per milch animal was about Rs. 1136 and Rs. 524 respectively on member households as against Rs. 1398 and Rs. 766 on non-member households. Interestingly, the overall average net income per milch animal, in case of non-members was the highest on landless labour households followed by marginal farmers. It was noted that the net income per milch animal on large farms of member group was statistically significant and higher than that of the large farms of non-member households. It was further noted that the overall per household net income was higher on member households than that of non-member households of Anand pattern while the reverse was true in U.P. pattern. Thus, it leads one to conclude that dairy co-operatives could not make positive impact on the net income from dairy enterprise on most of the categories of member households.

The results of seasonal milk productions fitted for the landless labour households of member and non-member groups of Anand pattern revealed that the regression coefficients of green fodder were positive and statistically significant in rainy season on member group and in rainy and winter seasons on non-member group. This indicated that per day milk production increased with an increase in the green fodder feeding in the respective seasons. The regression coefficient of dry fodder variable was found to have its negative impact in winter season

only on non-member landless labour households. It is interesting to note that the regression coefficients of concentrate variable were positive and statistically significant in all the seasons on member and non-member households. This indicated that this variable had substantial impact on milk production in the study area. The regression coefficient of human labour was found to have significantly positive influence in summer season and negative impact in rainy and winter seasons on non-member landless labour households of Anand pattern.

The results of the regression equations of cultivator households of Anand pattern revealed that regression coefficient of green fodder was found to have its negative impact in rainy season on non-member households. This could be attributed to excessive feeding of green fodder in the season. However, dry fodder was found to have its negative impact on milk production in summer season on non-member households. It is interesting to note that concentrate variable was positive and statistically significant in all the seasons on both member and non-member households and, thus, reflected its most powerful influence on milk production. The human labour was found to have negative impact in rainy and winter seasons on non-member households. It was observed that the coefficient of veterinary expenses was positive and statistically significant only in summer season on member households. This indicated that expenditure

incurred on veterinary medicines in summer season had positive impact on milk production. The regression coefficients of order of lactation in winter season on member households and that of stage of lactation in rainy and summer seasons were found to have their negative influence on milk yield on member households of Anand pattern.

In case of landless labour households of U.P. pattern, it was observed that the regression coefficients of green fodder in rainy and winter seasons on member households and that of dry fodder in winter and summer seasons were found to have positive influence on milk production on landless labour households of member group. The concentrate variable was also having positive impact in almost all the seasons on member and on non-member households of U.P. pattern. This indicated that per day milk production could be increased by feeding more of feeds and fodders in the respective seasons.

In case of cultivator households of U.P. pattern, it was observed that regression coefficients of green fodder, dry fodder and concentrate variables were found to have positive influence on milk yield in almost all the seasons on member cultivator households as reflected by their regression coefficients. This indicated that there existed enough scope for increasing milk yields by feeding increased quantities

of feeds and fodders. Almost similar situation existed on non-member households with regard to above stated variables. The regression coefficients of human labour was found to have positive and significant impact in all the seasons on member households. This indicated that increased use of human labour can increase milk production. The veterinary expenses variable was found to have positive influence on daily milk yield in summer season on member cultivator households.

In case of overall situation, it was observed that the regression coefficients of green fodder, dry fodder and concentrates were positive and statistically significant in almost all the seasons on the labour households of member group. The regression coefficients of labour variable in summer season and that of veterinary expenses in winter and summer seasons showed their negative influence on milk yield on non-member households. The regression coefficients of stage of lactation variable were found to be negative and statistically significant in winter and summer seasons on member households and only in summer season on non-member households. This supported the biological nature of lactation curve that as the stage of lactation advanced the milk production declined.

In case of cultivator households in overall situation, it is interesting to note that the regression coefficients of dry fodder and concentrate variable were positive and statistically significant in almost all the seasons on member and

non-member cultivator households. This indicated that milk production can be increased by increased feeding of concentrates and dry fodder.

The human labour variable was found to have positive influence on milk production in all the seasons on member households and negative influence in all the seasons on non-member households. The regression coefficients of value of milch animal were positive and statistically significant in winter season on member households and in rainy season on non-member households. This indicated that the higher value of milch animal was positively associated with higher milk yield on these households.

As regards the marginal value productivity, it was observed that in case of landless labour in overall situation the marginal value products of green fodder and dry fodder were positive and significantly higher than their acquisition price in almost all the seasons on member households, while in case of non-member households, MVPs of green fodder was positive and significantly higher in rainy and summer seasons and that of dry fodder only in rainy season. This indicated that there existed enough scope for increasing milk production by feeding more of green and dry fodders in the respective seasons. Interestingly, it was noted that the marginal value products of concentrate were found positive and significantly higher than

its acquisition price in all the seasons on member and non-member households. This indicated a substantial scope for increasing profits by feeding more of concentrate in all the seasons on both the groups of households. It was further observed that the increased use of human labour in rainy season only could increase returns on member households whereas human labour use should be decreased by non-member households for increased returns. In case of the marginal value productivity of inputs on cultivator households in overall situation, it is surprising to observe that the marginal value products of green fodder had negative impact on the returns in majority of the seasons on member and non-member households which does not conform to the logic. Therefore, it may be suggested that the feeding of green fodder in the respective seasons on both the groups of cultivator households should be reduced for increasing returns. The marginal value products of dry fodder and concentrate were positive and significantly higher than their prices in majority of the seasons on member and non-member households. It was further observed that the marginal value products of human labour were positive and significantly higher in only rainy season on member households. However, these were negatively significant in all the seasons on non-member households. The negative and low marginal value products of human labour than its acquisition price showed the

excessive use of human labour resulting in the loss to the households. Thus, it may be concluded that member and non-member households had ample opportunities for increasing their returns from dairy enterprise in different seasons through rational adjustments of various resources.

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B I B L I O G R A P H Y

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## BIBLIOGRAPHY

- Aul, G.D.,  
D.S.Sindhu and  
S.C.Gill 1974 Milk Production Function in  
Ludhiana district, Punjab.  
I.J.D.S., 27(4):284-289.
- Anantha, R.K. 1982 Impact of Dairy on land use, live-  
stock composition and Farm income  
of a Dairy Co-operatives in  
Rajasthan.  
Indian Co-operative Review,  
21(2):201-213.
- Burt, A.W.A. 1957 The influence of level of feeding  
during lactation upon yield and  
composition of Milk,  
Dairy Science Abstract Vol. 19:455.
- Agrawal, S.B.,  
R.K. Patel and  
P. Kumar. 1974 \*Production Function and Concen-  
trates in Milk Production for  
Haryana cows and Murrah buffaloes  
in rural area around Karnal\*.  
J. Indian Soc. Agril. Statistics.,  
29(1):155.
- Asha, A.J. 1950 \*Response of Milk Production to  
increased Grain Feeding\*.  
Journal of Farm Economics. No.174.
- Antill, A.G. 1956 \*Towards a Production for Dairy  
Farms\*. The Farm Economist,  
Vol. 8:1.
- Bahadure, J.Z.,  
C.B. Singh and  
R.K.Patel 1981 \*Milk Production Consumption and  
Marketed Surplus in some villages  
around Karnal\*.  
Agricultural Marketing,24(2):22.
- \*  
Chhikara, D.P.  
and A.C. Gangwar 1975 \*Resource Productivity in Milk  
Production and Returns from cattle  
crossbred cow and Murrah buffaloes\*.  
I.J.A.E., 30(3):145-148.
- \*Bhattacharjee, J.P. 1965 \*A note on Cattle in India's Farm  
Economy", I.J.A.E. Selected  
Readings (1940-64):30.

- Dasai, D.K. and  
A.V.S. Narayanan 1967 \*Impact of Modernization of Dairy  
Industry on the Economy of Kaira  
District., I.J.A.E., 22(3):64-67.
- Datta, J.P. 1981 \*Study of Marketed Surplus and  
Supply Functions for Milk in the  
Plains and High ranges of Kerala  
State\*. Ph.D. Dissertation (Un-  
published), N.D.H.I., Karnal.
- Dass, G.S. and  
S.S.Sindu 1978 \*A Study on Milk Production and  
Supply Function in Ludhiana  
District, Punjab\*.  
12th Annual Report, P.A.U.,  
Ludhiana.
- \*  
F.A.O. 1982 F.A.O., Monthly Bulletin, Feb.  
No. 5.
- George, K.M. 1977 \*Dairy and Rural Development\*.,  
Kurukshetra, 26(5):7-9.
- Gadre, N.A. and  
Sapate, B.G. 1980 \*Impact of Dairy Project on Rural  
Economy-A Case Study.  
I.J.A.E., 35(4):173.
- Gupta, J.M. and  
R.K. Patel 1985 \*Economic Appraisal of in crossbred  
cattle\*. I.J.A.E., 11(1):36-42.
- Jacob, T.,  
V.M. Amble,  
M.L. Mathur and  
A. Subha Rao. 1969 \*Milk Production Function and  
Optimum Feeding Schedules\*.  
I.J.A.E., 24(2):35-44.
- Jain, M.M. 1979 \*Upliftment of Rural Poor through  
Dairy Development\*.,  
Indian Dairyman, 31(4):259-269.
- Kadke, J.E. and  
House, A.K. 1972 \*The Effect of Technical Efficiency  
of Optimum Size\*, Farm Economist,  
44(5):428-432.
- Dhondhyal, S.P. and  
Paramatama Singh 1965 \*Economics of livestock Enterprise  
in Uttar Pradesh\*, I.J.A.E., 20(1):107.

- Kumar, P.,  
R.K. Patel and  
K.C. Raut 1975 \*Lactationwise Production and  
Concentration in Milk Production  
for Haryana Cow\*, I.J.A.E.,  
30(3):128-133.
- Kumar, P.,  
R.K. Patel and  
V.K. Keswan 1974 \*Economic Response of Feeding and  
Milk Production for different  
breeds of Milch cows\*,  
Brief Communication, XIV International  
Dairy Conference, India.
- Kumar, P.,  
C.C. Maji and  
R.K. Patel 1977 \*Returns on Investment in Research  
and Extension - A study on Indo-  
Swiss Cattle Improvement Project,  
Kerala\*, I.J.A.E., 22(5):207-216.
- Kumar, P. and  
R.P. Singh 1980 \*Dynamic Feed Milk Relationship and  
Technological Changes in Milk  
Production\*, I.J.A.E., 55(4):126.
- Murthy, M.S. 1964 \*Some Aspects on Economics of the  
Response of Milk to Feed\*,  
(unpublished) Diploma Thesis,  
Institute of Agricultural Research  
Statistics, I.C.A.R., New Delhi.
- Orton, F.J. 1958 \*The Economy of Feed Input in Milk  
Production\*, The Farm Economist,  
9(1):11-25.
- Patel, R.K. 1972 \*The Role of Dairy in Increasing  
Employment Potential for under-  
employed, Landless and Marginal  
Farmer\*, Indian Dairymen, 24(11):295-
- Pandey, R.N.,  
T.S. Bhogel and  
M.L. Verma 1975 \*Economic Impact of Dairy  
Development Project, Aligarh-  
A Research Bulletin

- Patel, H.K.,  
P. Kumar and  
Voegele, K.,  
Nair, R.S. and  
G.S. Nair 1976 \*Economics of crossbred Cattle-  
A study of the Cattle Breeding  
Programme of Indo-Swiss Project,  
Kerala\*, N.D.R.I., Karnal.
- Patel, R.K. and  
C.B. Singh 1981 \*Progress Report of Operational  
Research Project\*, N.D.R.I.,  
Karnal.
- Patel, R.K.,  
C.J. Singh and  
Ashok Kumar 1982 \*Seasonal Variation in Feed-Milk  
Relationship and Productivity of  
Feeds\*, Asian Journal of Dairy  
Research 1(2):141-147.
- Rai, S.C. and  
Raj Gopal Achar 1982 \*Milk Co-operatives and Rural  
Economy\*, Eastern Economist,  
78:9.
- Ramaswamy, C. 1977 \*Impact of Small Farmers Development  
Agency on Dairy benefactors in  
Patiala District in Punjab\*, M.Sc.  
Thesis (unpublished), N.D.R.I.,  
Karnal.
- Rangarajan, G.,  
Ramaswamy, C. and  
Phuazhendui, V. 1980 \*Milk Production with crossbred  
cows-A Micro Analysis\*, I.J.A.E.,  
34(4):161.
- Rao, V.M. 1981 \*Impact of Dairy Enterprise on  
Income and Employment Potentialities\*,  
Dairy Guide, 3(3):23-25.
- Rao, V.M. and  
C.B. Singh 1980 \*Economics of crossbred cows\*,  
Eastern Economist, January, 18,  
pp. 184-187.
- Rao, V.M. 1981 \*Impact of Dairy Enterprise on  
Income and Employment potentialities\*,  
Dairy Guide, 3(3):23-25.
- Rao, V.M. 1982 \*Farmers benefits from a Modern  
Milk Co-operative Society\*,  
Indian Co-operative Review. 20(1):50-59.
- Rao, K.M. 1960 \*On the study of an Economic Aspect  
of Dairy Feeding under Indian  
conditions\*, unpublished Diploma  
Thesis, Institute of Agricultural  
Research Statistics, I.C.A.R.  
New Delhi.

- Rao, V.M. and C.B. Singh 1960 "Cost and Return for crossbred cows", Indian Dairymen 51(2):105-108
- Rao, B., Sambusiva 1985 "Income and Employment potential of crop and Dairy Enterprise", Indian Dairymen 57(8):859-862.
- Redman, J.L. 1952 "Economic aspects of feeding for Milk Production", Journal of Farm Economic, 34:535.
- Redman, J.L. and Aileen, R.D. 1956 "Economic Problem in Feeding Dairy cows", Kentucky Agricultural Experimental Station Research Bulletin, 648.
- Sankhayan, P.L. and A.S. Joshi 1975 "Resource Productivity in milk production of crossbred and Indigenous cows in Rural Area of Ludhiana and Punjab State". I.J.A.E., 30(3):105-111.
- Sankhayan, P.L. and S.S. Miglani, 1975 "Estimation of Production in Ferozepur District of Punjab", Agriculture Marketing, 1-5.
- Saxena, B.L., J.P. Jain and S.S. Arya 1978 "Dairying Improves Village Economy", Indian Farming, 28(5):54-56.
- Shah, Dilip, R. 1975 "Impact of Operation Flood Project on Dairy Development of India", I.J.A.E., 30(3):158.
- ✓ Sharma, P.K. and C.B. Singh 1984 "Employment and Income generation from Dairy Enterprise in Intensive Cattle Development Project, Kernal-Asian Journal of Dairy Research, 3(5):149-155.
- Sharma, P.K. and C.B. Singh 1986 "Milk Production Consumption and marketed surplus of in Rural Kernal", Dairy Guide, 8(5):22-25.
- Singh, Parametara 1970 "Optimum Combination of Feed and Fodders in Dairy Enterprise on farms in Etah District (U.P)", Ph.D. thesis (Unpublished), I.A.R.I., New Delhi.

- Singh, C.B.,  
R.K. Patel,  
J.P. Dhaka and  
S.P. Sharma 1983 \*Management of Milk Procurement of  
the village level etc.\*,  
Agriculture Marketing, January issue
- Singh, I.J.,  
A.C. Gangwar  
and Bhakravarthy, R. 1979 \*Economics of Milk Production in  
Haryana State\*, Dept. of Agri.Eco.  
H.A.U. Hissar, Research Bulletin,  
No.4.
- Singh, C.B. 1965 \*Analysis of Feed Milk Relationship  
and cost of Production of Milk  
on farms in Delhi Area\*, I.J.A.E.  
20(1):97-107.
- Singh, C.B. 1977 \*A study of Feed Milk Relationship  
in Different breeds of Cattle and  
Buffaloes at N.D.R.I., M.Sc.  
Thesis (unpublished), N.D.R.I.,  
Karnal.
- Singh Parmatma  
and Daya Nath Jha 1975 \*Economic optima in Milk Production\*  
I.J.A.E., 30(3):96-105.
- Singh, Katar and  
Mukind Das 1982 \*Impact of Operation Flood at  
village level\*, Institute of Rural  
Management, Anand.
- Suhag, L.R.,  
Kumar, Vijay and  
Rathe, A.K. 1985 \*Role of Dairy Animals in Income and  
Employment generation on different  
size of Farms in Haryana\*,  
Indian Dairymen, 37(7):295-299.
- Thakur, D.S. 1975 \*Impact of Dairy Development  
through Milk Co-operatives- A case  
study of Gujarat\*, IJA.E. 30(5):
- William, R.E. and  
M.T. Jones 1969 \*Economic Relationship in Milk  
Production\*,  
Journal of Agricultural Economics,  
20(1):61.

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APPENDICES

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APPENDIX - I

Season-wise Average Price of Input and Output

Input	Rainy	Winter	Summer
Grass	10.00	-	12.50
Maize	10.00	-	12.00
Jowar	20.00	-	24.75
Cowpea	22.00	-	25.00
Berseem	-	30.00	33.50
Lucerne	-	31.50	36.75
Guar	-	12.00	15.00
Wheat Bhusa	25.00	30.00	15.00
Bajra Karbi	-	15.00	-
Barley	160.00	175.00	140.00
Gram	290.00	310.00	275.00
Kahli (Mustard Cake)	150.00	165.00	155.00
Chuni	200.00	210.00	190.00
Benola	325.00	360.00	310.00
Gur	225.00	240.00	210.00

Average Milk Prices (Rs./litre )

Buffalo                      2.10 - 2.75

Appendix - II

Zero Order Correlation Matrices of Marketed Surplus of Milk  
for Landless Labour on Member Households in Over All  
situation

	Milk Produ- tion	Monthly Disposable income and households	Education Score	Family Size	Price of Milk	AV. Value of Animals	
	1	2	3	4	5	6	7
<u>RAINY</u>							
Milk Production	1.0000						
Monthly Disposable Income of House- holds	.9701	1.0000					
Education Score	.0544	.0168	1.0000				
Family Size	.1021	.0300	-.0294	1.0000			
Price of Milk	.3657	.4395	.0106	-.2239	1.0000		
AV. Value of Animal	.1961	.1377	.1966	-.1559	.2040	1.0000	
<u>WINTER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9559	1.0000					
Education Score	.1201	.0694	1.0000				
Family Size	-.0184	.0295	.2563	1.0000			
Price of Milk	.4089	.4350	-.0033	-.1459	1.0000		
Av. Value of Animal	.1629	.0886	.1050	-.0900	.1319	1.0000	

Continued...

appendix - II

	1	2	3	4	5	6	7
<u>SUMMER</u>							
Milk Production		1.0000					
Monthly Disposable Income of Households		.9367	1.0000				
Education Score		.1699	.2173	1.0000			
Family Size		-.1050	-.0434	-.0074	1.0000		
Price of Milk		.0469	.1850	-.0210	-.1630	1.0000	
Av. Value of Animal		.1924	.1858	.1804	-.1838	.2391	1.0000

Appendix - III

Zero Order Correlation Matrix of Marketed Surplus for  
Cultivator Households on Membergroup in Over All Situation

	Milk Production	Monthly Disposable income and households	Education Score	Family Size	Price of Milk	Av. Value of Animals
	1	2	3	4	5	6
<u>RAINY</u>						
Milk Production	1.0000					
Monthly Disposable Income of Households	.6657	1.0000				
Education Score	.1747	.2498	1.0000			
Family Size	.0092	-.0259	-.0767	1.0000		
Price of Milk	.3738	.3388	.3643	-.0539	1.0000	
Av. Value of Animal	.1264	.0279	-.0160	.0859	-.0372	1.0000

Continued..

Continued...

Appendix - III

	1	2	3	4	5	6	7
<u>WINTER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.8686	1.0000					
Education Score	.2376	.1703	1.0000				
Family Size	.1010	.1415	.0346	1.0000			
Price of Milk	.4092	.4244	.4099	-.0696	1.0000		
Average Value of Animal	.1213	.1202	-.2655	-.0340	-.1071	1.0000	
<u>SUMMER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9488	1.0000					
Education Score	-.0550	.0402	1.0000				
Family Size	.1081	.0988	.0345	1.0000			
Price of Milk	.0554	.1457	.3726	-.0835	1.0000		
Average Value of Animal	.1008	.0746	-.0615	.0929	.0968	1.0000	

Appendix - IV

Zero Order Correlation Matrices of Marketed Surplus of Milk for  
Landless Labour Category on Non-Member Group in Over All Situation

	Milk Production	Monthly Disposable Income and Households	Education Score	Family Size	Price of Milk	Av. Value of Animals
1	2	3	4	5	6	7
<u>RAINY</u>						
Milk Production	1.0000					
Monthly Disposable Income of Households	.9223	1.0000				
Education Score	.5733	.3914	1.0000			
Family Size	.0852	-.0386	.2910	1.0000		
Price of Milk	.0118	.1072	.1600	.3444	1.0000	
Av. Value of animal	.3119	.1687	.3450	.1648	.0151	1.0000

Continued....

Appendix - IV

Continued....

	1	2	3	4	5	6	7
<u>WINTER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9928	1.0000					
Education Score	.3762	.4124	1.0000				
Family Size	.3031	.2995	.3284	1.0000			
Price of Milk	-.1428	-.0771	.0565	.2816	1.0000		
Av. Value of Animal	.3876	.3881	.4855	.2003	-.0323	1.0000	
<u>SUMMER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9895	1.0000					
Education Score	.2942	.2982	1.0000				
Family Size	.2111	.1763	.2827	1.0000			
Price of Milk	.3449	.3004	.2593	.4481	1.0000		
Av. Value of Animal	.2970	.2272	.4526	.1969	.5476	1.0000	

Appendix - V

Zero Order Correlation Matrices of Marketed Surplus of Milk for  
Cultivator Households on Non-Member Households in Over all Situation

	Milk Production	Monthly Disposable Income and Households	Education Score	Family Size	Price of Milk	Av. Value of Animals	
	1	2	3	4	5	6	7
<u>RAINY</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9788	1.0000					
Education Score	.4765	.5037	1.0000				
Family Size	.1327	.1815	.3448	1.0000			
Price of Milk	-.0328	.0467	.4822	.3538	1.0000		
Av. Value of Animal	.1248	.1618	.0417	-.0002	.2514	1.0000	

Continued.....

Appendix - V

Continued...

	1	2	3	4	5	6	7
<u>WINTER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9541	1.0000					
Education Score	.4389	.4801	1.0000				
Family Size	.1656	.2989	.3448	1.0000			
Price of Milk	.2127	.2123	.5502	.3918	1.0000		
Average Value of Animal	.1753	.1206	.0306	-.0618	.0532	1.0000	
<u>SUMMER</u>							
Milk Production	1.0000						
Monthly Disposable Income of Households	.9337	1.0000					
Education Score	.1120	.2915	1.0000				
Family Size	.3622	.5032	.3901	1.0000			
Price of Milk	.1862	.2321	.4702	.4263	1.0000		
Average Value of Animal	-.1563	-.1001	-.2382	.0922	.1806	1.0000	

Appendix - VI

Zero Order Correlation Matrix of Productivity Model for Landless Labour households on Member Group in Overall Situation

	G.F.	D.F.	Concent.	H.L.C.	Vety.	Value of Animal	Order of Lactation	Stage of Lactation
1	2	3	4	5	6	7	8	9
<u>RAINY</u>								
G.F.	1.0000							
D.F.	.2705	1.0000						
Concent.	.6032	.4681	1.0000					
H.L.C.	.4093	.1331	.6558	1.0000				
Vety.	-.2493	.1032	-.0411	.0292	1.0000			
Value of Animal	.1486	.4750	.0303	-.1259	-.2169	1.0000		
Order of Lactation	.2078	-.0148	-.0314	-.1005	-.2035	-.1419	1.0000	
stage of Lactation	-.5476	-.1185	-.4703	-.4534	-.0979	.0014	.2404	1.0000

continued...

Continued...

Appendix - VI

1	2	3	4	5	6	7	8	9
<u>WINTER</u>								
G.F.	1.0000							
D.F.	.1895	1.0000						
Concent.	.3573	.5281	1.0000					
H.L.C.	.1628	.2490	.7252	1.0000				
Vety.	.1434	-.2149	-.1487	-.0590	1.0000			
Value of animal	.1425	.2418	.1230	-.1783	.0522	1.0000		
Order of Lactation	-.1790	-.0122	-.0549	-.0312	-.2182	-.2865	1.0000	
Stage of Lactation	-.0741	-.1552	-.5676	-.6681	.0504	.1626	.0061	1.0000
<u>SUMMER</u>								
G.F.	1.0000							
D.F.	.4754	1.0000						
Concent.	.5862	.2904	1.0000					
H.L.C.	.5001	.0150	.4982	1.0000				
Vety.	.0799	-.1076	-.0225	.1727	1.0000			
Value of Animal	.4435	.5161	.3260	.1284	-.1089	1.0000		
Order of Lactation	-.0893	.1151	-.0155	-.2180	-.1391	-.3241	1.0000	
Stage of Lactation	-.0146	.0051	-.4518	-.2802	-.0834	.0078	-.0377	1.0000

Appendix - VII

Zero Order Correlation Matrices of Productivity Model  
for Cultivator Households of Member Societies in  
Over all situation

	G.F.	D.F.	Concent.	H.L.C.	Vety.	Value of Animal	Order of Lactation	Stage of Lactation
1	2	3	4	5	6	7	8	9

RAINY

G.F.	1.0000							
D.F.	.4526	1.0000						
Concent.	.5859	.4694	1.0000					
H.L.C.	.1667	.1971	.1097	1.0000				
Vety.	-.1305	-.1183	-.1337	.0256	1.0000			
Value of Animal	.4019	.3697	.4691	-.0101	-.1974	1.0000		
Order of Lactation	.0835	.1682	.0271	.1557	.0230	-.2246	1.0000	
Stage of Lactation	-.2523	-.2284	-.4218	-.0002	-.0991	-.2705	.1092	1.0000

G.F. = Green fodder

D.F. = Dry fodder

Concent. = Concentrate

H.L.C. = Human Labour Cost

Vety. = Veterinary expenses

Continued....

## Appendix - VII

	1	2	3	4	5	6	7	8	9
<u>WINTER</u>									
G.P.	1.0000								
D.F.	.3122	1.0000							
Concent.	.3992	.5141	1.0000						
H.L.C.	.2283	.3938	.4320	1.0000					
Vety.	.1186	-.0534	.0502	-.0702	1.0000				
Value of Animal	.1254	.2547	.3578	.1419	.0079	1.0000			
Order of Lactation	.1673	.0352	.0267	.1676	-.1029	-.2736	1.0000		
Stage of Lactation	-.1805	-.2715	-.4022	-.2510	-.0984	-.3197	.1641	1.0000	
<u>SUMMER</u>									
G.P.	1.0000								
D.F.	.2034	1.0000							
Concent.	.2661	.4652	1.0000						
H.L.C.	.1304	.2410	.3481	1.0000					
Vety.	.1051	-.0772	-.0127	.1963	1.0000				
Value of Animal	-.0249	.1447	.1910	.0154	-.1189	1.0000			
Order of Lactation	.0411	.0337	-.0215	-.2268	-.0422	-.3502	1.0000		
Stage of Lactation	-.2057	-.2096	-.3072	.4707	.0283	-.3218	.2676	1.0000	

Appendix - VIII

Zero Order Correlation Matrices of Productivity Model for  
Landless Labour Households on Non-Member group in Over All  
Situation

	G.F.	D.F.	Concent.	H.C.L.	Vety.	Value of Animal	Order of Lactation	Stage of Lactation
1	2	3	4	5	6	7	8	9
<u>Rainy</u>								
G.F.	1.0000							
D.F.	.4393	1.0000						
Concent.	.4422	.6998	1.0000					
H. C. L.	.1720	.5178	.5305	1.0000				
Vety.	.2592	-.0938	-.0199	.0156	1.0000			
Value of animals	-.0788	.4738	.2790	.4131	.0082	1.0000		
Order of Lactation	-.1326	-.2043	-.2719	-.3116	-.1532	-.2154	1.0000	
Stage of	-.5279	-.2145	-.3673	-.1812	-.1579	.0643	.5571	1.0000

Continued....

Continued....

## Appendix - VIII

	1	2	3	4	5	6	7	8	9
<u>WINTER</u>									
G.F.	1.0000								
D.F.	.4318	1.0000							
Concent.	.5064	.4171	1.0000						
H. C.L.	-.1004	-.0526	.0710	1.0000					
Vety.	.2995	-.1630	.2638	.2012	1.0000				
Value of Animals	.3473	.4625	.4166	-.2199	.0609	1.0000			
Order of Lactation	.0111	-.0919	-.0711	.1832	.2128	-.4166	1.0000		
Stage of Lactation	-.5668	-.2079	-.5258	-.0198	-.2080	-.2689	.4181	1.0000	
<u>SUMMER</u>									
G.F.	1.0000								
D.F.	-.0782	1.0000							
Concent.	.1208	.3893	1.0000						
H. C.L.	-.3263	.1603	.0000	1.0000					
Vety.	-.4144	.2501	.4170	.3213	1.0000				
Value of Animal	-.0066	.0804	.4905	.2766	.3765	1.0000			
Order of Lactation	.0602	.2118	-.0463	-.2593	-.1934	-.3995	1.0000		
Stage of Lactation	.0072	-.2086	-.3963	-.2756	-.3944	-.2949	.3308	1.0000	

Appendix - IX

Zero Order Correlation Matrix of Productivity Model for Cultivator  
Households Non-Member group in Over All Situation

	G.F.	D.F.	Concent.	HCL	Vety.	Value of Animal	Order of Lactation	Stage of Lactation
1	2	3	4	5	6	7	8	9
<u>RAINY</u>								
G.F.	1.0000							
D.F.	-.4026	1.0000						
Concent.	.3900	.0061	1.0000					
H. C.L.	-.1856	-.0302	.1629	1.0000				
Vety.	.1883	.0616	.0638	-.2786	1.0000			
Value of Animal	.3039	-.0955	.0743	-.2980	-.0015	1.0000		
Order of Lactation	.0011	-.1191	-.2017	.1953	-.0698	-.2722	1.0000	
Stage of Lactation	.0598	-.2140	-.3690	-.0214	-.0302	-.1018	.4899	1.0000

Continued...

Continued....

## Appendix - IX

	1	2	3	4	5	6	7	8	9
<u>WINTER</u>									
G.F.	1.0000								
D.F.	.0704	1.0000							
Concent.	.1954	.4945	1.0000						
H.C.L.	-.3267	-.0109	.1021	1.0000					
Vety.	-.0644	.0036	-.2483	.1561	1.0000				
Value of Animal	.3404	.1199	.3027	-.1690	-.2747	1.0000			
Order of Lactation	-.0344	.1537	-.0717	.0349	.0289	-.3246	1.0000		
Stage of Lactation	-.2604	-.4507	-.0229	-.2782	-.1530	.0998	0.4369	1.0000	
<u>SUMMER</u>									
G.F.	1.0000								
D.F.	.3268	1.0000							
Concent.	.0304	.6185	1.0000						
H.C.L.	-.1496	.6185	.1341	1.0000					
Vety.	-.1772	.0711	-.1934	.0297	1.0000				
Value of Animal	-.1663	-.1540	-.2168	-.1319	-.0777	1.0000			
Order of Lactation	.0451	-.0991	.0797	.0285	.1820	-.2755	1.0000		
State of Lactation.	-.1790	.3011	-.2912	.0834	.1267	-.2658	.0769	1.0000	

APPENDIX - X

Scale for Different Types of Animals for  
Standard Animal Unit.

Sr. No.	Type of Animals	Local cow	Buffalo	Crossbred
1.	In Milking	1.1	1.3	1.4
2.	In Milking (Pregnant)	1.2	1.4	1.5
3.	Dry (Pregnant)	1.0	1.2	1.3
4.	Dry (Not-Pregnant)	0.80	0.90	1.0
5.	Heifer (Pregnant)	0.80 (Above 3 yr)	1.0 (Above 3 yr)	1.1 (Above 18 months)
6.	Heifer (Not Pregnant) ( 2 - 3 years)	0.70	0.80	0.90
7.	Youngstock Female ( 1 - 2 years)	0.40	0.50	0.70
8.	Youngstock (Upto One Year )	0.25	0.25	0.30
9.	Working Bovine	1.00	1.00	1.00

*For family  
labour → it is  
used according to  
Permanent wage and  
rate in area  
for hired → actual*

1 man day of 8 hrs : 1.5 women  
work  
1 " " = 2 work days  
of child.

Ref. Lotun Singh's thesis Page 83

APPENDIX - XI

Average Milk Yield of Milch Animals on  
Different Category of Households.

(In Litres)

Category of households	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<u>Anand Pattern</u>						
Landless labour	3.08	3.97	2.38	3.05	3.69	1.76
Marginal	2.76	3.44	2.07	4.31	4.97	2.67
Small	3.72	3.92	1.67	2.28	3.75	2.25
Medium	7.17	5.10	1.85	5.00	5.90	2.15
Large	5.80	5.52	1.66	6.22	7.37	2.56
Overall	3.75	4.17	2.00	4.07	4.77	2.18
<u>U.P. Pattern</u>						
Landless labour	2.41	3.55	2.32	5.69	4.90	2.81
Marginal	2.94	4.00	2.23	2.75	3.92	2.37
Small	4.29	4.33	2.47	3.47	5.35	3.24
Medium	2.81	3.27	1.75	4.43	3.67	1.92
Large	3.59	4.32	2.79	3.40	3.00	2.21
Overall	3.00	3.73	2.21	4.08	4.13	2.47
<u>Overall</u>						
Landless labour	2.84	3.82	2.35	4.12	4.19	2.18
Marginal	2.81	3.61	2.12	3.53	4.44	2.52
Small	3.94	4.08	1.98	2.94	4.64	2.80
Medium	3.72	3.78	1.77	4.57	4.22	1.97
Large	4.66	4.90	2.24	4.25	4.75	2.35
Overall	3.42	3.97	2.09	4.08	4.42	2.34

APPENDIX - XII

Average Milk Yield of Lactating Animals  
in Different Seasons.

(in Litres )

Category of households	Member			Non-member		
	Rainy	Winter	Summer	Rainy	Winter	Summer
<u>Anand pattern</u>						
Landless labour	5.69	5.41	4.47	5.57	4.23	3.02
Marginal	6.42	5.52	3.59	5.87	5.41	2.75
Small	8.64	6.88	4.08	5.29	5.55	3.67
Medium	8.42	5.30	2.82	7.17	5.80	2.40
Large	8.35	6.69	2.69	9.55	7.41	3.01
Overall	6.92	5.75	3.88	6.05	5.39	2.92
<u>U.P. Pattern</u>						
Landless labour	5.50	5.36	3.65	6.57	5.28	3.37
Marginal	5.64	4.86	3.44	4.84	4.91	4.31
Small	6.31	4.55	3.81	7.34	6.02	4.05
Medium	5.73	5.35	3.88	6.18	4.99	3.59
Large	5.70	5.14	4.28	5.73	5.48	4.33
Overall	5.77	5.11	3.73	6.34	5.08	3.73
<u>Overall</u>						
Landless Labour	5.59	5.38	4.06	6.07	4.75	3.19
Marginal	6.03	5.19	3.01	5.35	5.16	3.53
Small	7.47	5.71	3.94	6.31	5.78	3.86
Medium	7.07	5.32	3.35	6.67	5.39	2.99
Large	7.02	5.91	3.49	7.64	6.44	3.67
Overall	6.34	5.43	3.80	6.19	5.23	3.33